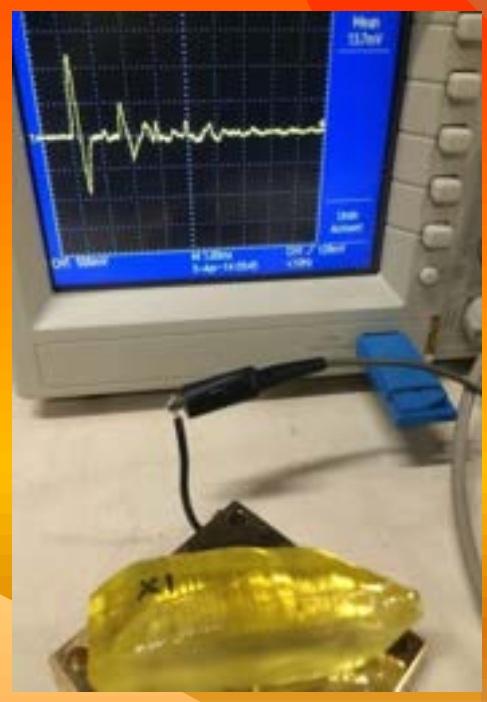
ANNUAL REPORT2015

April 2015 - March 2016



Yoshikawa Lab.

Since 2007

IMR, Tohoku University

ANNUAL REPORT 2015 Yoshikawa Lab. IMR, Tohoku Univ.

Contents

Preface

Dear Colleagues and Collaborators,

Thank you for downloading the Annual Report of the *Yoshikawa Laboratory* in the Institute for Materials Research (IMR) and *Yoshikawa Project* in the New Industry Creation Hatchery Center (NICHe), Tohoku University. As usual, we distribute the Annual Report in digital format that helps us to save some trees required for the paper production and to make it easier for you to access the copy of the Report at any time when your computer is with you.

The Report contains a summary of our research activities and selected papers published in FY2015. The current issue covers our progress within academic year from April 2015 to March 2016. In this period, we had continued development of our basic technologies considering both practical and fundamental points of view. Some of our achievements are listed below:

- Further progress in studies of Ce:GAGG crystals for gamma-ray scintillators. This year, performance of the Ce:(Gd,Y,Lu)AGG crystals was further improved by their co-doping with divalent ions, following stabilization of the Ce^{4+} centers.
- Crystal growth of halide materials. As an example, one- and two-inch diameter $CeBr_3$ crystals were grown by Bridgman method using modified micro-pulling down apparatus.
- Development of two-inch diameter La-substituted GPS crystals with exceptionally high temperature stability.
- Growth of langasite type crystals. Al-substituted CTGS crystals are studied for their application in oscillators, resonators, and combustion pressure sensors. Bulk crystal growth technology for two-inch diameter CTGS is established.
- Fiber growth technology of processing resistant material, such as Ir based alloy and CCM are developing. Some of the fibers were successfully growth from the melt.

Our long-term policy is to develop chains of research capabilities that connect three areas of expertise as follows: (1) materials production (including crystal growth), (2) materials physics and characterization, and (3) application of the materials in current and prospective devices. Such chain was built for the scintillating materials and for the piezoelectric materials.

Our projects are always supported by our colleagues from all over the world, and this collaboration is generally very successful. The details of their contribution are reflected in the papers published within the above period and incorporated into the Report.

Laboratory members took part in preparation of this Report. I appreciate their efforts and kind help very much. I wish also thank all of our colleagues from Japan and overseas that had participated in our research projects and significantly contributed to their progress.

We are looking forward to make our world better, and we appreciate your help in this job.

Akira YOSHIKAWA

Professor,
Institute for Materials Research (IMR), Tohoku University
New Industry Creation Hatchery Center (NICHe), Tohoku University
March, 2016

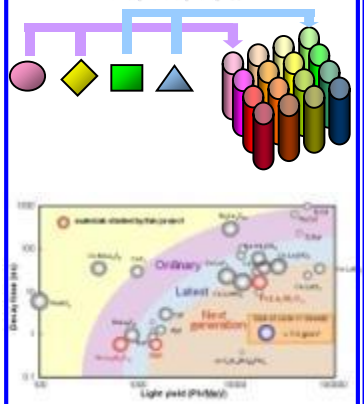
Research digest

吉川研究室の研究体制

結晶材料設計 | 結晶成長 | 回折結晶学・分析化学 | 物性 | デバイス・装置化

マテリアル・デザイン

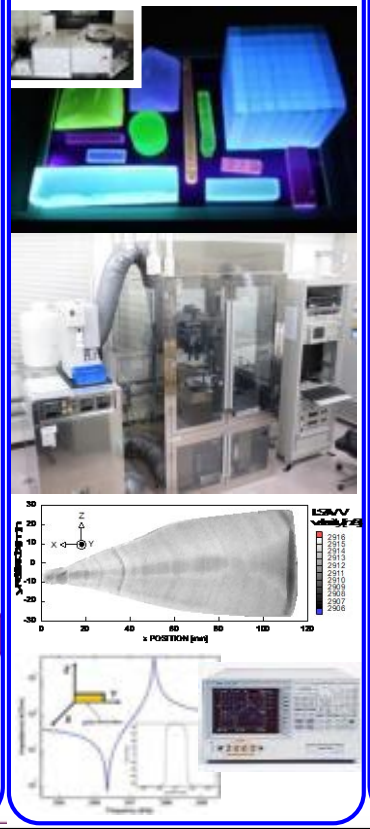
Al, B, Y, …
Ce, Pr, Nd, Tm, …
Ca, Na, K, ..



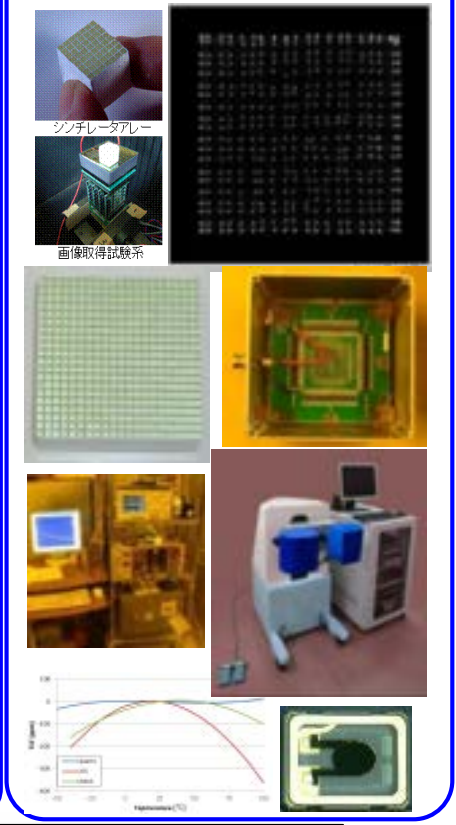
結晶作製

結晶性・組成評価

特性評価



デバイス・装置評価



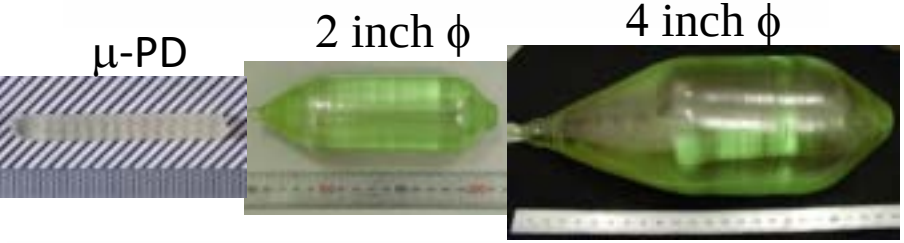
物質設計・結晶成長・結晶性評価・物性・デバイス＆装置化；
基礎科学を上流から下流まで垂直統合する体制で外部エネルギーと結晶の相互作用の視点から新規結晶を創り、機能性追求を目指す。

ガンマ線用シンチレータの開発

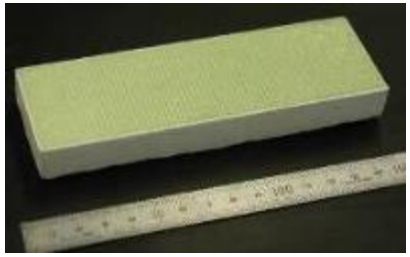
Pr:LuAG シンチレータ

NEDO大学発事業創出実用化研究開発事業「MRI-PET用Pr:LuAG＋APDアレー放射線検出器ｼｽﾃﾑの開発」
PL：吉川 （2008-2011）

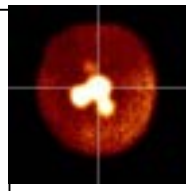
高品質・大型結晶作製技術の開発



アレー作製技術、アッセンブリ技術の開発



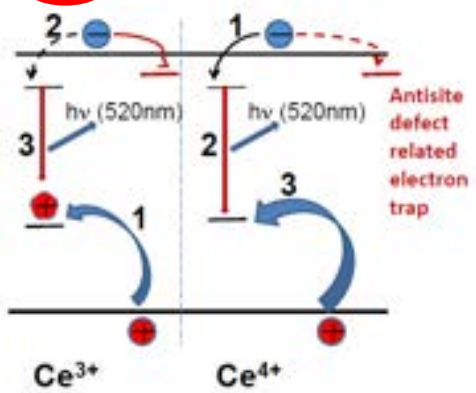
産学連携研究により
検出器開発

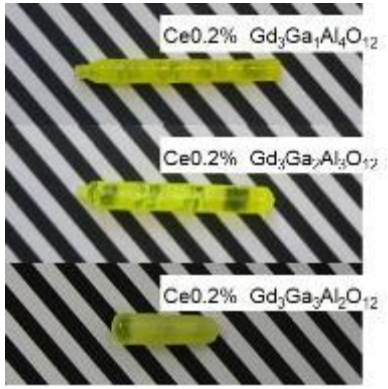


乳がん診断用PET
装置の実現に貢献

Ce:GAGG シンチレータ

JST研究成果展開事業「無人ヘリ搭載用散乱エネルギー認識型高位置分解能ガンマカメラの実用化開発」
分担開発者：吉川、黒澤 （2012-2014）
厚生労働科学研究費補助金「非侵襲血中RI濃度測定を可能にするウエアラブル・サブミリ解像度PET装置の開発」
分担開発者：吉川、鎌田 （2013-2015）
NEDO革新的ものづくり産業創出連携促進事業「次世代高分解能PET装置を拓く、新規高性能シンチレータの量産技術開発」
PL：鎌田 （2015-2017）



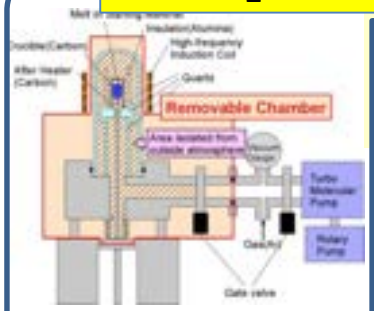


- **バンドギャップエンジニアリングによる新規高性能シンチレータの発明**
- **大型結晶作製技術の開発**
- **発光高速化現象の原理解明**

各種ガンマカメラの共同開発。更に新規PET装置開発事業への展開。

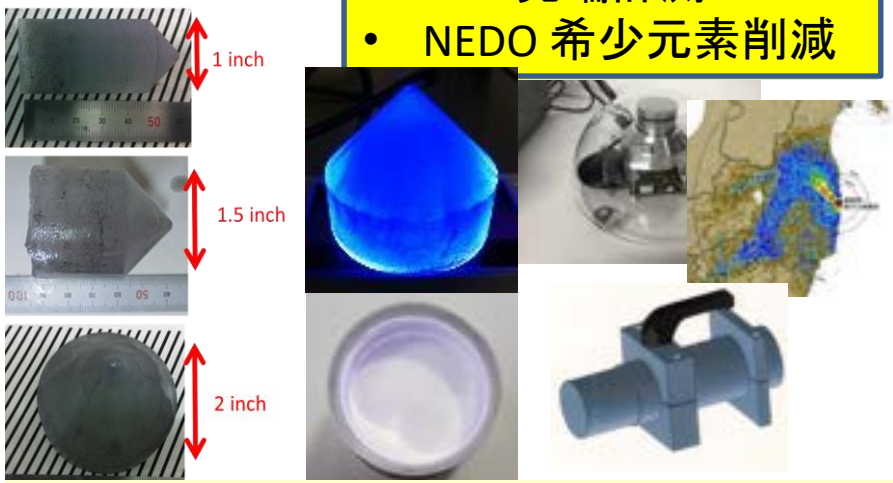
ガンマ線用シンチレータの開発（Eu:SrI_2 & Ce:La-GPS）

Eu:SrI_2 高エネルギー分解能



採択プロジェクト
（累計総額3億円以上）

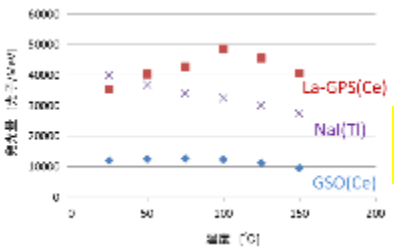
- 経産省「震災復興イノベーション」PL吉川
- JST　先端計測
- NEDO 希少元素削減



- 独自の育成・パッケージ技術の確立
- 結晶の2インチ化に先駆けて成功
- エネルギー分解能3%台達成
- 放射線検出器へのマウント
- 共同研究先から検出器の市販開始

論文等：Y. Yokota, A. Yoshikawa et.al., *J. Cryst. Growth*(2011)+他4報

Ce:La-GPS：優れた高温耐性

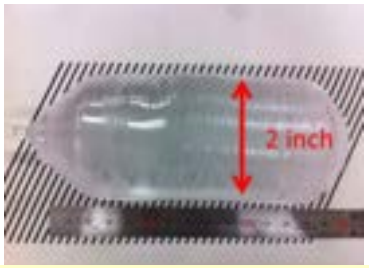


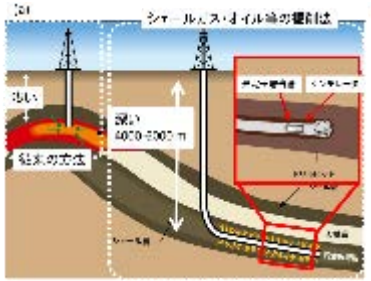
採択プロジェクト
（累計総額1億円以上）

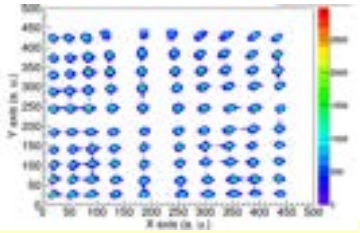
- JST A-step実用化PL吉川

高温での発光量維持

資源探査への応用期待





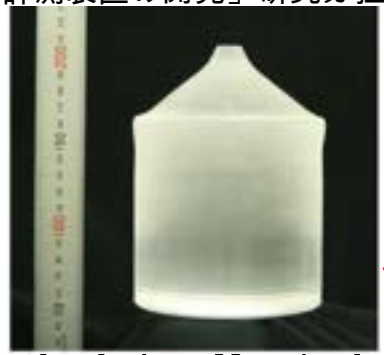


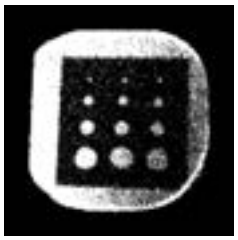
- 新規材料（東北大単独で特許取得、PCT：各国移行中）
- 結晶の2インチ化に成功、アレイカメラ開発
- 複数社と共同研究中
- 有償サンプルの供給開始

論文等：S. Kurosawa, A. Yoshikawa et.al., *NIMA*(2014), A. Yoshikawa, K. Kurosawa et.al., Cryst. Growth & Des. (2015)+他6報

中性子用 シンチレータ

厚労省科研費 医療機器研究開発推進事業「高速セルイメージングを可能にする次世代X線CT用ハロゲン化物シンチレータの開発」PL：吉川　（2008-2011）
JST A-Step シーズ育成「核物質セキュリティ用3He代替中性子計測装置の開発」研究分担者　吉川・横田（2012-2015)

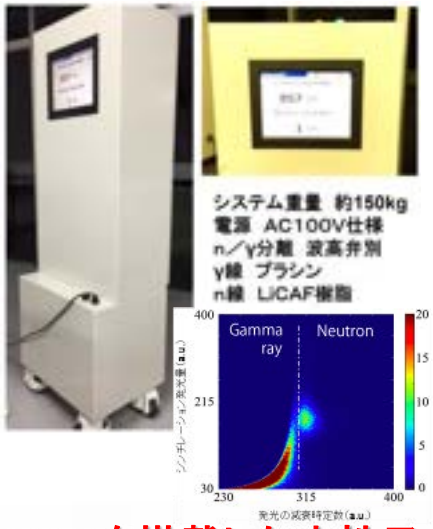




Y. Yokota, A. Yoshikawa et.al., *Cryst. Growth & Des.*(2011)

4inch ϕ　インゴット+他13報

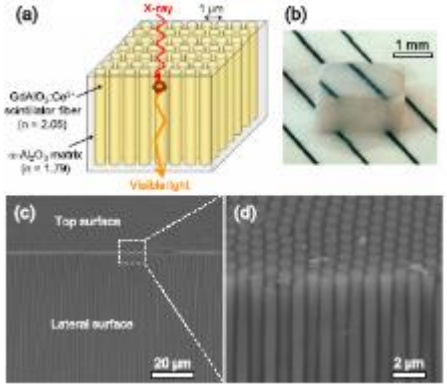
^{3}He ガスに代わる固体材料LiCAF シンチレータ

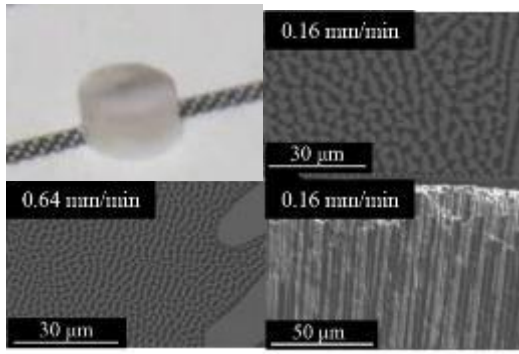


LiCAFを搭載した中性子検出器の作製・実用化試験実施。

共晶体シンチレータ

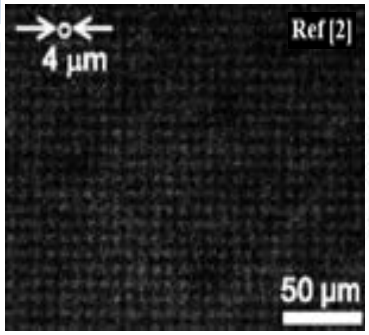
JST Astepハイリスク挑戦タイプ「X線位相イメージングを飛躍させる超高解像度、高感度X線検出器の実用化開発」
PL：吉川　（2014-2016）
JST Astep FS「共晶体ファイバー構造を応用した、超高分解能、高感度中性子イメージング装置の開発」
PL：鎌田　（2014-2015）

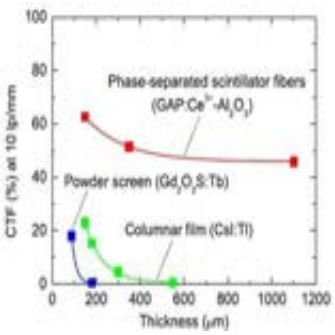


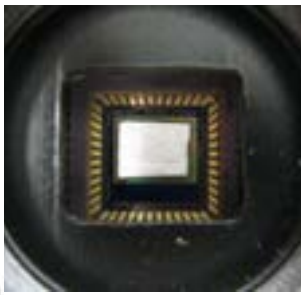


2元系共晶$GdAlO_3$/sapphire　　3元系共晶LiF/$LiBaF_3$/CaF_2

- **ファイバー状共晶体構造を利用した光導波型シンチレータの実現**
- **新規共晶体シンチレータの開発**







産学連携によるX線位相イメージング装置開発事業への展開。

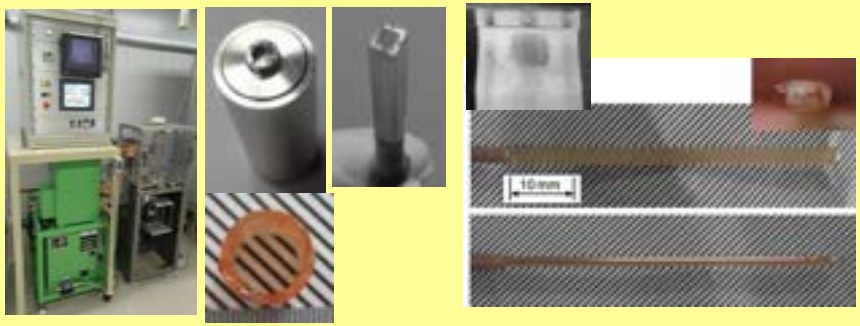
CERNの次世代検出器開発プロジェクトに参画（アジアから唯一）！

INTELUM project Kick-Off Meeting @ CERN on 11, March, 2015

圧電結晶の開発とその応用

戦略的基盤技術高度化支援事業
「燃焼圧センサー用ランガサイト型圧電結晶の形状制御単結晶作製装置及び作製技術の開発」 SL：吉川（2011−2012年度）
グローバル技術連携・創業支援補助金
「燃焼圧センサ用形状制御圧電結晶作製を可能にする特殊合金坩堝の鋳造技術と連続原料供給システムの開発」PL：吉川 （2012年度）

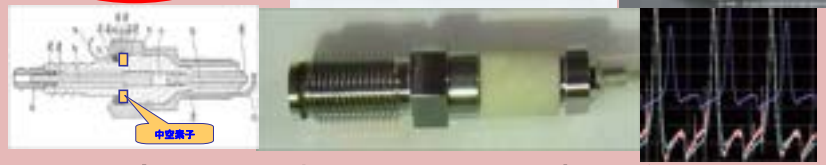
形状制御結晶育成技術の開発（ランガサイト型結晶）



・形状制御ランガサイト型圧電結晶を作製することで製造コストが大幅に削減

燃焼圧センサ試作器の開発

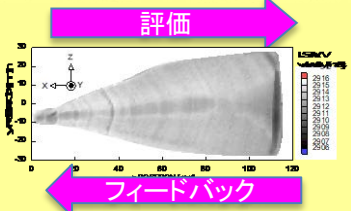
燃費改善効果：
M/T車 約10%,
A/T車 約4%



・トルク変動を燃焼圧センサーで直接検知
→更なる燃焼率改善、No_x低減が可能

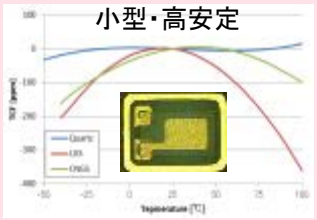
NEDO希少金属代替・低減技術実用化開発助成事業
「小型振動子用ランガサイト型圧電結晶材料におけるランタン、ガリウムおよびタンタル元素低減技術の開発」PL：吉川 （2013-2014年度）
NEDO戦略的省エネルギー技術革新プログラム（実用化開発）
「新規圧電結晶を用いた低コスト・省電力タイミングデバイスの開発」
PL：吉川 （2014-2016年度）
NEDO新エネルギーベンチャー技術革新事業（フェーズAおよびB）
「新規圧電結晶を用いた屈曲振動子等による発電技術の開発」
PL：吉川 (2014-2016年度)

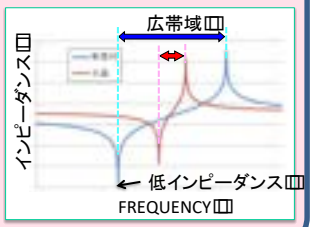
新型CTGAS圧電結晶の開発と評価

高精度定数・温度係数決定、均質性評価と改善でデバイス実用化に貢献

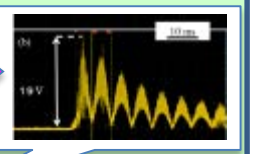
新型省電力振動子の開発



広帯域・高速起動


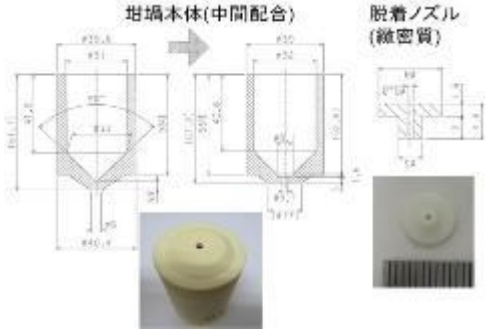
振動発電素子の開発

230Hzで19V(160μW)を達成



難加工性合金線材

経産省 戦略的基盤技術高度化支援事業「難加工性機能性合金の形状制御結晶育成技術の開発」SL：吉川　（2011-2013）
経産省 橋渡し研究助成事業「量産型マイクロＰＤ装置の開発」
PL：横田（2014-2015)

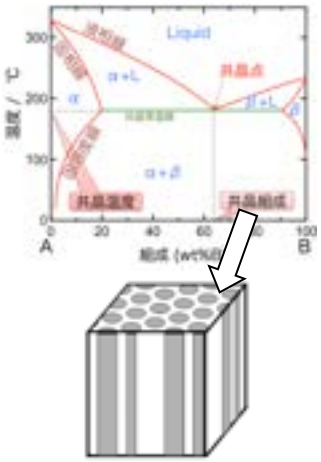


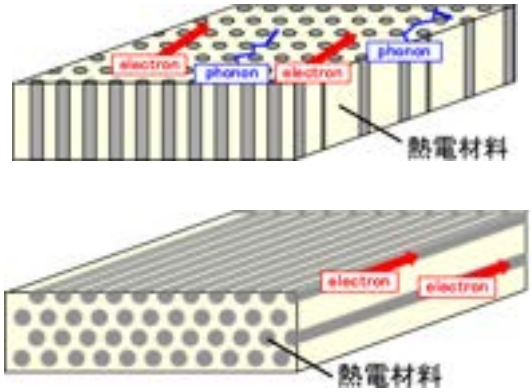
中小企業と共に難加工合金線材の製造が可能な製造装置・部材の開発を実施(地域産業創成)

長尺Ir合金、Pt合金線材の製造に成功。田中貴金属と実用化研究を実施中。

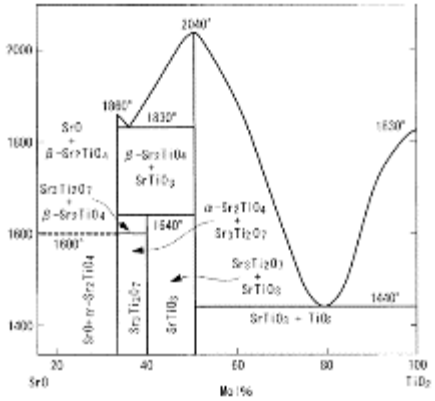
共晶体構造熱電材料

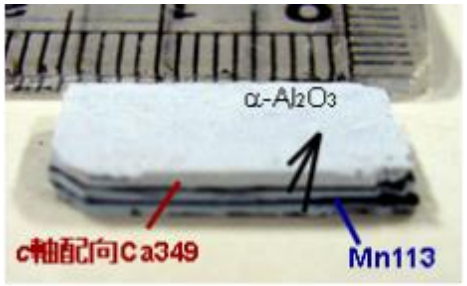
NEDO熱電変換材料・デバイス高性能高信頼化技術開発
「共晶体構造を用いた高性能指数熱電酸化物材料の研究開発」
PL：吉川　（2015-2016）

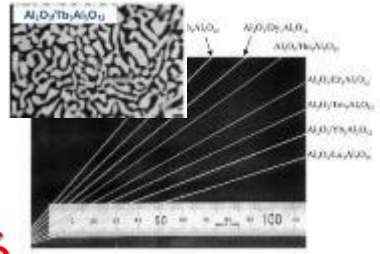




共晶体構造を利用した世界初の高特性熱電材料を開発する研究





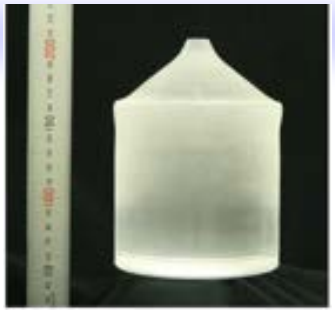


共晶体構造を利用した世界最高特性の酸化物熱電材料(*ZT*>4)を実現する。

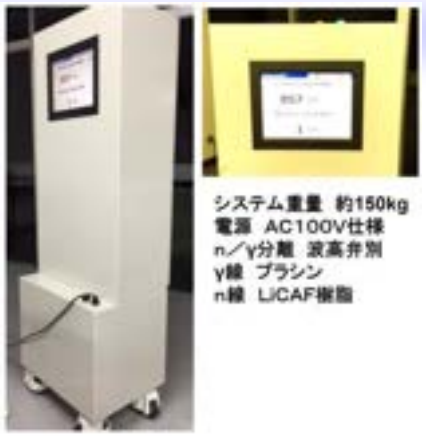
事業化の例

①Pr:LuAGシンチレータ
古河機械金属社から製品化

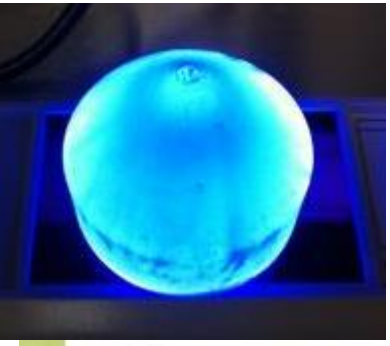
②Pr:LuAG搭載の乳房用PET装置
古河シンチテック社から製品化



③中性子用シンチレータ
LiCAF ㈱トクヤマから製品化



④LiCAFを搭載した中性子検出器
ポニー工業から製品化
（セキュリティ応用）

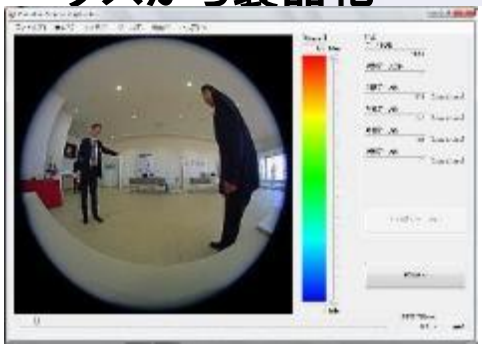


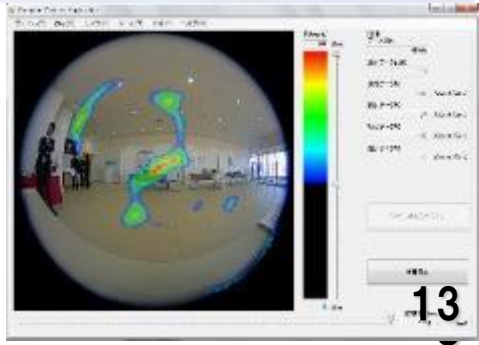
⑤Ce:GAGGシンチレータ
古河機械金属、
㈱C＆Aから
製品化

⑦Eu:SrI_2シンチレータ
㈱C＆Aから製品化

⑥ガンマキャッチャー
（Ce:GAGGを搭載した
コンプトンカメラ）
浜松ホトニクスから製品化

⑧Eu:SrI_2を搭載し
たスペクトロメータ
千代田テクノル
から製品化





受賞・新聞等

1. 2010.11.19, 河口範明, 日本電子材料技術協会第47回秋季講演大会優秀賞,「高時間分解能X線・ガンマ線検出器用シンチレーター結晶の開発」
2. 2011.5.31, 横田 有為, 田中貴金属グループ MMS 賞「貴金属に関わる研究助成金」
3. 2011.8.3, 杉山 誠, 放射線夏の学校　優秀ポスター賞,「Nd添加LuAG単結晶を用いたX線撮像検出器の試作」
4. 2011.8.3, 黒澤 俊介, 放射線夏の学校　最優秀ポスター賞,「真空紫外線発光シンチレータとガス検出器による2次元高計数率検出器の開発」
5. 2011.11.15, 藤本 裕, 第31回応用物理学会講演奨励賞
6. 2012.3.21, 杉山 誠, 東北大学工学研究科長賞
7. 2012.5.25, 黒澤俊介, 第1回新化学技術研究奨励賞,「小型・耐水放射線検出器による河川での放射線量モニタ用のシンチレーション結晶開発」
8. 2013.10.9, 吉川彰, 財団法人服部報公会 **報公賞**,「ガーネット型シンチレータの開発と放射線検出器への展開」
9. 2013.11.6, 鎌田圭, 第11回日本結晶成長学会奨励賞,「GAGGシンチレータの開発と放射線検出器への応用」
10. 2013.11.19, 黒澤俊介, 吉川彰, 他 第35回(2013年秋季)応用物理学会講演奨励賞,「赤・近赤外線発光シンチレータの開発と応用研究」
11. 2014.3.4, 鎌田圭, 平成25年度トーキン科学技術賞「高性能シンチレータ及びそれを用いた放射線検出器の開発」
12. 2015.3.5, 黒澤俊介, トーキン科学技術賞,「大深度でのシェールガス等の資源探査を可能にする革新的素子の開発」
13. 2014.4.15, 吉川彰, 鎌田圭, 平成26年度科学技術分野の**文部科学大臣表彰(科学技術賞)**,「高性能シンチレータ及びそれを用いた放射線検出器の開発」
14. 2015.5.18, 黒澤俊介, インテリジェント・コスモス奨励賞,「パイロシリケート結晶の発光材料としての網羅的な研究」
15. 2015.5.25, 黒澤俊介, 本間記念賞,「パイロシリケート結晶の発光材料としての網羅的な研究」
16. 2015.8.27, 吉川彰, 鎌田圭, JST, NEDO 大学発ベンチャー表彰**経済産業大臣賞**

日経新聞(2015年5月1日)


日刊工業新聞
2014年8月4日

河北新報2014年5月9日

河北新報(2014年9月20日)


電気新聞(2014年9月8日)

日経新聞(2012年1月6日)

鎌田　吉川

Combination of μ-PD and CZ method for development of novel scintillator single crystals

Challenge and study for developing of novel single crystalline optical materials using micro-pulling-down method

Akira Yoshikawa [a,*], Martin Nikl [b,d], Georges Boulon [c], Tsuguo Fukuda [a]

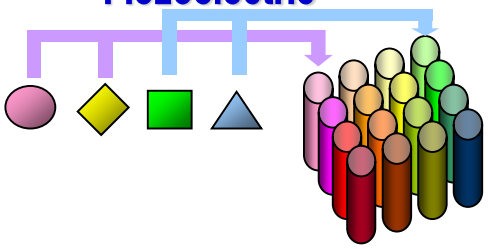
[a] Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Katahira 2-1-1 Aoba-ku, Sendai 980-8577, Japan
[b] Institute of Physics, AS CR, Cukrovarnicka 10, 162 53 Prague, Czech Republic
[c] Physical Chemistry of Luminescent Materials, Claude Bernard Lyon 1 University, UMR 5620 CNRS, Villeurbanne, France
[d] Dip. Scienza dei Materiali, Universita di Milano-Bicocca, via Cozzi 53, 20125 Milano, Italy

Available online 31 January 2007

Opt. Mater. 30 (2007) 6

Micro-pulling method
Quick materials screening of candidate crystals

Laser, nonlinear
Scintillator
Faraday rotator
Piezoelectric



feedback

CZ method
High quality bulk single crystal

Characterization

SEM-EDS-EPMA
Composition analysis

XRC
Crystallinity

PL, RL
Luminescence properties

Radiation response
Light yield, scintillation decay

Members

2015 年度　吉川研究室
Members (2015 academic year)

4. 1. 2015

Professor		**教授**	
Dr.	Akira Yoshikawa	吉川　彰	NICHe 兼任
Associate Professor		**准教授**	
Dr.	Yuui Yokota	横田　有為	NICHe
Dr.	Kei Kamada	鎌田　圭	NICHe
Assistant Professor		**助教**	
Dr.	Shunsuke Kurosawa	黒澤　俊介	
Dr.	Yuji Ohashi	大橋　雄二	
Adviser		**顧問**	
Prof	Masae Kikuchi	菊地　昌枝	
Prof	Touetsu Shishido	宍戸　統悦	
Technical Counsellor		**技術参事**	
	Hiroshi Uemura	上村　博	
Assistant		**技術補佐研究員**	
	Keiko Toguchi	戸口　景子	
	Megumi Sasaki	佐々木　愛美	
Secretaries		**秘書**	
	Yuka Takeda	武田　悠佳	

	Kuniko Kawaguchi	川口　邦子	
Researcher		**研究員**	
	Yasuhiro Shoji	庄子　育宏	
	Robert Kral	ロバート　クラル	学振特別研究員
Graduate Students		**大学院生**	
	Akihiro Yamaj	山路　晃広	D3
	Tetsuo Kudo	工藤　哲男	D1
	Masanori Kitahara	北原　正典	M2
	Tomoki Ito	伊藤　友樹	M2
	Rikito Murakami	村上　力輝斗	M2
	Aya Nagura	名倉　亜耶	M2
	Chieko Tanaka	田中　智恵子	M1
	Hiroyuki Chiba	知場 啓志	M1
	Takahiro Horiai	堀合　毅彦	M1
	Hiroyuki Yamaguchi	山口　大聡	M1
Researchers		**民間等共同研究員**	
	Hisakazu Nagato	長門　久和	(株)C＆A
	Shoki Hayasaka	早坂　将輝	(株)C＆A

	Idzumi Chida	千田　いづみ	(株)C＆A
	Tsuneyoshi Miki	三木　常義	由利工業(株)
	Yusuke Takahashi	高橋　祐介	由利工業(株)
	Osamu Eguchi	江口　治	（株）Piezostudio
	Kenji Inoue	井上　賢司	（株）Piezostudio
	Hiroyuki Amano	天野　宏之	（株）Piezostudio
	Takuya Sato	佐藤　拓也	（株）Piezostudio
	Masayuki Ito	伊藤　正敏	（株）Piezostudio
	Yuji Machida	町田　有司	（株）Piezostudio
Visiting Professors/Researchers		**客員教授**	
Prof.	Georges Boulon	ジョージ　ブーロン	France
Prof.	Martin Nikl	マーチン　ニクル	Czech Republic
Dr.	Vladimir V.Kochurikhin	ヴラディミール カチューリッヒン	Russia
Dr.	TCHANI Valery	チャニ　ワレリー	Canada
Visiting Researchers		**客員研究員**	
Dr.	Jan Pejchal	ヤン　ペジャール	Czech Republic
Dr.	Andrey Medvedev	アンドレ　メドベージェフ	Russia

List of International collaborations

Visits by International Collaborator 2015

Affiliation	Researcher	Research Theme
General Physics Institute (Russia)	Dr. V. Kochurikhin	Growth of bulk single crystals and automatic diameter control in Czochralski growth
LPCML, CB Lyon1 Univ. (France)	Dr. G. Boulon	Transparent ceramics with Spark Plasma Sintering method, and INTELUM workshop
Svetcha (Canada)	Dr. V. Chani	Growth of bulk single crystals
Institute of Physics CAS (Czech Republic)	Dr. M. Nikl	Characterization of various scintillator materials, and INTELUM workshop
Institute of Physics CAS (Czech Republic)	Dr. K.Bartosiewic	Growth and characterization of oxide scintillator crystals, and INTELUM workshop
Stanford University, California (USA)	Dr. C.Levin	PET/MRI applications
The University of Tennessee (USA)	Dr. M. Zhuravleva	Growth and characterization of halide scintillator crystals, and JSPS186 workshop
National Centre for Nuclear Research (Poland)	Dr. L. Swiderski	Growth and characterization of various scintillator crystals, and JSPS186 workshop
CRYTUR (Czech Republic)	Dr. J. Houžvička	Growth and characterization of scintillator and laser materials, and JSPS186 workshop
CERN (Switzerland)	Dr. E. Auffray	INTELUM meeting and workshop
CERN (Switzerland)	Dr. P. Lecoq	INTELUM meeting and workshop
University of California, Berkeley (USA)	Dr. E. Bourchesne	INTELUM meeting and workshop
University of Milan (Italy)	Dr. M. Fasoli	INTELUM meeting and workshop
Institute for Scintillation Materials (Ukraine)	Dr. O. Sidletskiy	INTELUM meeting and workshop
CRYTUR (Czech Republic)	Dr. S. Ochesanu	INTELUM meeting and workshop

Seminar at Yoshikawa Laboratory 2015

Date	Affiliation	Speaker	Title of speech
August 25-26	Stanford University, California (USA)	Dr. C.Levin	Positron emission tomography system technologies under study at Stanford
February 6-8	Institute of Physics CAS (Czech Republic)	Pr. M. Nikl	Band gap and defect engineering strategies in the complex oxide scintillators optimization: the differences for Ce and Pr-doping
February 6-8	Institute of Physics CAS (Czech Republic)	Dr. K.Bartosiewic	Luminescence Quenching and Scintillation Response in Ce3+ Doped GdxY3-xAl5O12 Single Crystals

Visits to International Collaborator 2015

Affiliation	Researcher	Period of stay
Institute of Physics CAS (Czech Republic)	Assoc. Pr. Kurosawa Mr. Ito	September 27-30
Soltan Institute for Nuclear Studies (Poland)	Assoc. Pr. Kamada	October 24-25
European Organization for Nuclear Research, CERN (Switzerland)	Assoc. Pr. Kurosawa Mr. Murakami Mr. Horiai, Mr. Yamaguchi Miss. Tanaka	February 27-28
CB Lyon1 University (France)	Pr. Yoshikawa Assoc. Pr. Yokota Assist. Pr. Kurosawa Mr. Murakami Mr. Horiai, Mr. Yamaguchi Miss. Tanaka	March 1-4

List of Research collaborations

【大学・研究機関との共同研究】

Joint research with universities and research institutes in Japan

1. 東京大学　共同研究　Tokyo University

2. 大阪大学レーザーエネルギー学研究センター　共同研究
Institute of Laser Engineering, Osaka University

3. 京都大学　Kyoto University

4. 自然科学研究機構分子科学研究所　大学共同利用施設　UVSOR

5. 国立研究開発法人放射線医学総合研究所　共同研究
National Institute of Radiological Sciences

6. 名古屋大学　共同研究　Nagoya University

7. 名古屋工業大学　共同研究　Nagoya Institute of Technology

8. 山形大学　共同研究　Yamagata University

9. 山梨大学　共同研究　Yamanashi University

10. 信州大学　共同研究　Shinshu University

11. 千葉大学　共同研究　Chiba University

12. 広島大学　共同研究　Hiroshima University

Research funds

平成 27 年度　研究資金
Research funds (2015 fiscal year)

【経済産業省－東北経済産業局】

Tohoku Bureau of Economy, Trade and Industry
The Ministry of Economy, Trade and Industry

1. 戦略的基盤技術高度化支援事業(サポイン)
Funding Program for Strategic Supporting Industry, 2014
株式会社インテリジェント・コスモス研究機構からの再委託研究
Truster: Intelligent Cosmos Research Institute, Miyagi pref.
「Ce:GAGGシンチレータ結晶の量産化における大型結晶製造プロセスの低コスト化」
" Cost reduction of mass-production of large-sized Ce:GAGG scintillator crystals"
期間　Term:　2014.10 - 2017.3
本年度 Total:　6,430,000 yen for our team, 2015.4 - 2016.3

2. 中小企業による技術シーズの事業化・実用化事業のうち橋渡し研究支援事業
Funding Program for small business innovation research, 2014
株式会社東栄科学産業からの再委託研究
Truster: Toei Kagaku Co.Ltd
「量産型マイクロＰＤ装置の開発」
"Development of mass-production of micro-pulling-down apparatus"
期間　Term:　2014.11 - 2016.3
本年度 Total:　5,890,000 yen for our team, 2015.4 - 2016.3

【NEDO プロジェクト】

New Energy and Industrial Technology Development Organization

1. 平成２６年度戦略的省エネルギー技術革新プログラム・実用化開発
Strategic Energy-saving Innovation Programs, 2014
東芝照明プレシジョン株式会社からの再委託研究

Truster: Toshiba Shomei Precision Corporation
「新規圧電結晶を用いた低コスト・省電力タイミングデバイスの開発」
“Development of new piezoelectric oscillator for reducing cost and power consumption”
期間　Term:　2015.2 – 2016.6
本年度 Total:　45,400,000 yen for our team, 2015.4 – 2016.3

2. 平成２６年度新エネルギーベンチャー技術革新事業
Grand renewable Energy Innovation Programs, 2014
株式会社Ｃ＆Ａからの再委託研究
Truster: C&A Corporation
「新圧電材料を用いた屈曲振動子等による発電技術の開発」
“Development of power generation technology based on tuning fork vibrator using new piezoelectric material”
期間　Term:　2014.12 – 2016.9
本年度 Total:　11,890,000 yen for our team, 2015.4 - 2016.3

3. 平成２７年度　未利用熱エネルギーの革新的活用技術研究開発
Thermal energy Management and Innovation Promotion, 2015
「共晶体構造を用いた高性能指数熱電酸化物材料の研究開発」
“Research &development of highly efficient thermoelectric oxide material having eutectic structure”
期間　Term:　2015.10 – 2017.3
本年度 Total:　5,000,000 yen for our team, 2015.4 - 2016.3

4. 平成２７年度　革新的ものづくり産業創出連携促進事業
Industrial Innovation Promotion Project, 2015
「次世代高分解能ＰＥＴ装置を拓く、新規高性能シンチレータ量産技術開発」
“Development of mass-production technology of new high-performance scintillator for next generation PET apparatus”
期間　Term:　2015.10 – 2018.3
本年度 Total:　29,400,000 yen for our team, 2015.4 - 2016.3

5. 平成２７年度　希少金属代替省エネ材料開発プロジェクト
Rare Metal Substitute Materials Development Project, 2015
株式会社Ｃ＆Ａからの再委託研究

Truster: C&A Corporation
「白金フリーるつぼによる世界最高発光量シンチレータの開発および放射線検出器への応用」
“Development of high-yield scintillator using Pt-free crucible, and its radiation detector applications”
期間　Term:　2015.4 – 2016.3
本年度 Total:　6,870,000 yen for our team, 2015.4 - 2016.3

【JST プロジェクト】

Japan Science and Technology Agency

1. JST研究成果展開事業
研究成果最適展開支援プログラム（A-STEP）ハイリスク挑戦タイプ
Foundation for High-risk challenging, 2014
キヤノン株式会社からの再委託研究
Truster: Canon Inc.
「X線位相イメージングを飛躍させる超高解像度、高感度X線検出器の実用化開発」
“Development of ultra-high resolution and highly sensitive X-ray detector for innovative X-ray phase imaging”
期間　Term:　2014.12 - 2016.11
本年度 Total:　21,400,000 yen for our team, 2015.4 - 2016.3

2. JST研究成果展開事業
研究成果最適展開支援プログラム（A-STEP）
実用化挑戦ステージ実用化挑戦タイプ　（中小・ベンチャー開発）
Foundation for Small and Medium Enterprise Promotion, 2013
株式会社Ｃ＆Ａからの再委託研究
Truster: C&A Corporarion
「高温域で劣化しない資源探査用シンチレーター」
“Scintillator for Resources Exploration Equipment having high performance at high temperature”
期間　Term:　2013.12 - 2017.3
本年度 Total:　15,300,000 yen for our team, 2015.4 - 2016.3

3. JST研究成果展開事業 【先端計測分析技術・機器開発】
Development of Systems and Technology for Advanced Measurement and Analysis Technology, 2013
株式会社千代田テクノルからの再委託研究
Truster: Chiyoda Technol Corporation
「高エネルギー分解能・高スループットの国産放射測定検査装置」
“Development of radiometry tester having high energy resolution and high efficiency”
期間 Term: 2013.10 - 2016.3
本年度 Total: 2,000,000 yen for our team, 2015.4 - 2016.3

4. JST研究成果展開事業 （戦略テーマ重点タイプ）
Strategic Energy-saving Programs, 2015
「３次元圧電単結晶スプリングを用いた振動発電の研究開発」
“Research & development of power generation technology based on coil spring vibrator using 3D shaped piezoelectric crystal”
期間 Term: 2016.1 - 2021.3
本年度 Total: 2,700,000 yen for our team, 2016.1 - 2016.3

5. JST研究成果最適展開支援プログラム （A-STEP）シーズ顕在化タイプ
Adaptable and seamless technology transfer program through targetdrive R&D, 2013
「特定小電力無線向け弾性表面波フィルタの開発」
“Development of SAW filter for specified low power radio application”
期間 Term: 2013.12 – 2017.3
本年度 Total: 1,450,000 yen for our team, 2015.4 - 2016.3

6. JST研究成果展開事業 （A-STEP）産業ニーズ対応タイプ
Adaptable and seamless technology transfer program through targetdrive R&D, 2015
「レーザー駆動指向性中性子の発生・制御及び検出に関する基盤技術開発」
“Development of basic technology on generation, control and detection of laser-driven directional neutron”
期間 Term: 2016.1 – 2020.3
本年度 Total: 6,200,000 yen for our team, 2016.1 - 2016.3

【復興庁】　Reconstruction Agency

1. 平成２４年度地域イノベーション戦略支援プログラム
   Funding Program for “Invest Japan” promotion for reconstruction, 2012
   宮城県インテリジェントコスモス研究機構からの再委託プログラム
   Truster: Intelligent Cosmos Research Institute, Miyagi pref.
   「次世代自動車のための人材育成プログラム」
   “Manpower training program for innovation in automotive industry”
   期間　Term:　2012.4 - 2017.3
   本年度 Total:　8,2400,000 yen for our team, 2015.4 - 2016.3

【厚生労働省科学研究費補助金】

Ministry of Health, Labour and Welfare

平成２５年度科学研究費助成　Health Science Research Grants, 2013　(AMED)
東京大学からの再委託研究
Truster: Tokyo University
「非侵襲血中 RI 濃度測定を可能にするウエアラブル・サブミリ解像度 PET 装置の開発」
“Development of wearable and sub-millimeter resolution type PET apparatus that enables non-invasive measurement of RI concentration in blood”
期間　Term:　2013.4 - 2016.3
本年度 Total:　15,600,000 yen for our team, 2015.4 - 2016.3

【日本学術振興会】Japan Society for the Promotion of Science

二国間交流事業　International Joint Research Program
期間　Term:　2013.4 - 2016.3
本年度 Total:　2,250,000 yen for our team, 2015.4 - 2016.3

【文部科学省科学研究費補助金】

Ministry of Education, Culture, Sports, Science and Technology
日本学術振興会　Japan Society for the Promotion of Science
科学研究費助成　Grants-in-Aid for Scientific Research

1. 挑戦的萌芽－分担　Grants-in-Aid for young scientists(Sprout)
　吉川　彰　(Akira Yoshikawa)

2. 若手研究（A）　Grants-in-Aid for young scientists(A)
　横田　有為　(Yuui Yokota)

3. 挑戦的萌芽　Grants-in-Aid for young scientists(Sprout)
　鎌田　圭　(Kei Kamada)

4. 挑戦的萌芽－分担　Grants-in-Aid for young scientists(Sprout)
　黒澤　俊介　(Shunsuke Kurosawea)

5. 若手研究（B）　Grants-in-Aid for young scientists(B)
　黒澤　俊介　(Shunsuke Kurosawea)

6. 基盤研究（C）－分担　Grants-in-Aid for young scientists(Scientific Research (C))
　大橋　雄二　(Yuji Ohashi)

7. 特別研究員　Fellowship
　山路　晃広　(Akihiro Yamaji)

【企業・財団・個人からの受託・共同研究，寄付金および小型プロジェクト】

Funds from industry, foundations, personal donation and small project

1. キヤノン株式会社 Canon Inc.
2. 株式会社千代田テクノル Chiyoda Technol Corporation
3. 浜松ホトニクス株式会社 Hamamatsu Photonics K.K
4. 株式会社トクヤマ Tokuyama Corporation
5. 古河機械金属株式会社 Furukawa Co. Ltd
6. 株式会社 東芝 TOSHIBA Corporation
7. 東芝照明プレシジョン株式会社 Toshiba Shomei Precision Corporation
8. ＴＤＫ株式会社 TDK Corporation
9. 由利工業株式会社 Yurikogyo Co. Ltd
10. TANAKA ホールディングス株式会社 Tanaka Holdings Co. Ltd.
11. 株式会社フルヤ金属 Furuya Metal Co. Ltd.
12. 株式会社東栄科学産業 Toei Kagaku Co. Ltd
13. 三菱化学株式会社 Mitsubishi Chemical Corporation
14. 三菱電機株式会社 Mitsubishi Electric Corporation
15. 日立金属株式会社 Hitachi Metals, Ltd
16. 株式会社三幸 Sanko Corporation

17. 株式会社Ｃ＆Ａ　　C&A Corporation

18. 株式会社Piezo Studio　　Piezo Studio Inc.

19. 日揮・実吉奨学会研究助成金　　JGC-S scholarship Foundation

20. 材料科学技術振興財団研究助成金　　MST scholarship Foundation

21. インテリジェントコスモス学術振興財団研究助成金
Intelligent Cosmos scholarship Foundation

平成 27 年度　特許出願リスト
List of Patent Application (2015 fiscal year)

1. 発光体及び放射線検出器

   鎌田　圭、吉川　彰、黒澤　俊介、横田　有為、庄子　育宏
   (Kei Kamada, Akira Yoshikawa, Shunsuke Kurosawa, Yuui Yokota, Yasuhiro Shoji)

2. 発光体及び放射線検出器

   吉川　彰、黒澤　俊介、鎌田　圭、横田　有為、大橋　雄二、村上　力輝斗,
   庄子　育宏
   (Akira Yoshikawa, Shunsuke Kurosawa, Kei Kamada, Yuui Yokota, Yuji Ohashi,
   Rikito Murakami, Yasuhiro Shoji)

3. 結晶材料及び放射線検出器

   吉川　彰、鎌田　圭、横田　有為、黒澤　俊介、庄子　育宏
   (Akira Yoshikawa, Kei Kamada, Yuui Yokota, Shunsuke Kurosawa, Yasuhiro Shoji)

4. 結晶材料及び放射線検出器

   黒澤　俊介、吉川　彰、横田　有為、鎌田　圭、大橋　雄二、村上　力輝斗、
   堀合　毅彦
   (Shunsuke Kurosawa, Akira Yoshikawa, Yuui Yokota, Kei Kamada, Yuji Ohashi,
   Rikito Murakami, Takahiko Horiai)

他　国内出願　６　件

List of conferences

International conference and symposia

国際学会

1. Bulk Single Crystal Growth of Ca3Ta(Ga,Al)3Si2O14 Single Crystals

Akira Yoshikawa, Yasuhiro Shoji, Yuji Ohashi, Yuui Yokota, Tetsuo Kudo, Kei Kamada, Shunsuke Kurosawa, Andrey Medvedev

2015 IEEE ISAF/ISIF/PFM

May. 24-27. 2015/ Biopolis, Matrix Building, Singapore

(Poster)

2. Effects of Al Doping on Crystal Growth and Piezoelectric Properties of Ca3NbGa3Si2O14 Single Crystals

Yuui Yokota, Tetsuo Kudo, Yuji Ohashi, Andrey Medvedev, Shunsuke Kurosawa, Kei Kamada, Akira Yoshikawa

2015 IEEE ISAF/ISIF/PFM

May. 24-27. 2015/ Biopolis, Matrix Building, Singapore

(Oral)

3. Homogeneity Evaluation of Ca3Ta(Ga0.5Al0.5)3Si2O14 Single Crystal by the Line-Focus-Beam Ultrasonic Material Characterization System

Yuji Ohashi, Tetsuo Kudo, Yuui Yokota, Yasuhiro Shoji, Shunsuke Kurosawa, Kei Kamada, Akira Yoshikawa

2015 IEEE ISAF/ISIF/PFM

May. 24-27. 2015/ Biopolis, Matrix Building, Singapore

(Oral)

4. Growth of Ca3Ta(Ga1-xAlx)3Si2O14 Single Crystals and Their Piezoelectric Properties

Tetsuo Kudo, Yuui Yokota, Yuji Ohashi, Yasuhiro Shoji, Kei Kamada, Andrey Medvedev, Shunsuke Kurosawa, Akira Yoshikawa

2015 IEEE ISAF/ISIF/PFM

May. 24-27. 2015/ Biopolis, Matrix Building, Singapore

(Oral)

5. Origin of UV-Induced Infrared Absorption Band in Ce:GAGG

R. Inaba, M. Kitaura, K. Kamada, S. Kurosawa, A. Ohnishi, K. Hara

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Poster / mini Oral)

6. Radiation Hardness of Gd-Based Oxide Scintillators

S. Kurosawa, R. Murakami, A. Yamaji, Y. Shoji, J. Pejchal, Y. Ohashi, Y. Yokota, K. Kamada, A. Yoshikawa
13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Poster / mini Oral)

7. Growth of Gadolinium Pyrosilicate Based Eutectics and Their Scintillation

K. Kamada, S. Kurosawa, Y. Yokota, J. Pejchal, Y. Ohashi, A. Yoshikawa
13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Poster / mini Oral)

8. Single Crystal Growth of Cerium and Praseodymium Doped YCa4O(BO3)3

K. Kamada, S. Kurosawa, Y. Yokota, J. Pejchal, Y. Ohashi, A. Yoshikawa
13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Poster / mini Oral)

9. Luminescent Study on Ce-Doped Hafnate Ceramics Samples Prepared by the SPS

S. Kurosawa, H. Koichi, P. Jan, Y. Yokota, Y. Ohashi, K. Kamada, A. Yoshikawa
13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Poster / mini Oral)

10. Luminescence and Scintillation Properties of Li4SiO4 Single Crystals for Neutron Scintillators

J. Pejchal, V. Babin, A. Beitlerova, S. Kurosawa, Y. Yokota, A. Yoshikawa, M. Nikl
13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)
Jun. 7-12. 2015 / Berkeley, CA, USA
(Oral)

11. High Dynamic Range Monitoring of Slow Decay Components in Garnet-Based

P. Bruza, D. Panek, T. Parkman, K. Kamada, S. Kurosawa, A. Yoshikawa, J. Tous, J. Houzvicka, K. Blazek, M. Kucera, M. Mueller, K. Mann, M. Nikl

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Poster / mini Oral)

12. Luminescence Quenching and Scintillation Characteristics in (Y,Gd)3Al5O12 Single Crystals Doped with Ce3+

K. Bartosiewicz, V. Babin, K. Kamada, A. Yoshikawa, J. Mares, A. Beitlerova, M. Nikl

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Poster / mini Oral)

13. Growth and Luminescence Properties of Eu:SrI2 Single Crystals Prepared by Modified Micro-Pulling-down Method

R. Kral, J. Pejchal, K. Nitsch, V. Jary, S. Kurosawa, Y. Yokota, M. Nikl, A. Yoshikawa

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Poster / mini Oral)

14. Crystal Growth and Scintillation Properties of 1.5 Inch Eu:SrI2 Bulk Single Crystal

Y. Yokota, S. Kurosawa, R. Kral, Y. Shoji, J. Pejchal, Y. Ohashi, K. Kamada, A. Yoshikawa

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Poster / mini Oral)

15. Large Size Czochralski Growth and Scintillation Properties of Mg2+ Co-Doped Ce:Gd3Ga3Al2O12

K. Kamada, Y. Shoji, V. V. Kochurikhin, A. Nagura, S. Okumura, S. Yamamoto, J. Y. Yeom, S. Kurosawa, J. Pejchal, Y. Yokota, Y. Ohashi, M. Nikl, A. Yoshikawa

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Oral)

16. Scintillation Properties of Large Size Ce:La-GPS Crystals Grown by the Czochralski Process

S. Kurosawa, Y. Shoji, R. Murakami, M. Kitaura, V. Jary, J. Pejchal, Y. Ohashi, Y. Yokota, K. Kamada, A. Onishi, M. Nikl, A. Yoshikawa

13th International Conference on Inorganic Scintillators and Their Applications (SCINT2015)

Jun. 7-12. 2015 / Berkeley, CA, USA

(Oral)

17. ZnWO4

Hiroyuki Sekiya, Shunsuke Kurosawa, Akira Yoshikawa

CYGNUS2015 Workshop

Jun. 2-4. 2015 / Occidental College in Los Angeles, CA, USA

(Oral)

18. Czochralski growth and properties of Ce:Gd3(Ga,Al)5O12 and Gd2-xLax-yCeySi2O7 scintillator crystals

Yasuhiro Shoji, Shunsuke Kurosawa, Kei Kamada, Yuui Yokota, V.V.Kochurikhin, Akira Yoshikawa

11th International Conference on Ceramic Materials and Components for Energy and Environmental Applications (11th CMCEE)

Jun. 14-19. 2015 / Vancouver, B.C., Canada

(Oral / invited)

19. SMILE : Sub-MeV/MeV Gamma-ray Survey using Electron-Tracking Compton Camera loaded on Balloon

A. Takada, T. Tanimori, H. Kubo, T. Mizumoto, Y. Mizumura, T. Sawano1, K. Nakamura, Y. Matsuoka, S. Komura, S. Nakamura, T. Kishimoto, M. Oda, T. Takemura, S. Miyamoto, Y. Nakamasu, K. Yoshikawa, J. D. Parker, K. Miuchi, S. Kurosawa

AAS High Energy Decadal Meeting

Jun. 29 – July 1. 2015 / Chicago

(Poster)

20. Luminescent Properties Of Ce-Doped Gadolinium Pyrosilicate Crystals Grown By The Floating Zone Method

Shunsuke Kurosawa, Toetsu Shishido, Takamasa Sugawara, Akiko Nomura, Kunio Yubuta, Yasuhiro Shoji, Rikito Murakami, Yuui Yokota, Jan Pejchal, Yuji Ohashi, Kei Kamada, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

21. Czochralski Growth of 2 Inch Ca3Ta(Ga,Al)3Si2O14 Single Crystals For Piezoelectric Application

Akira Yoshikawa, Yasuhiro Shoji, Yuji Ohashi, Yuui Yokota, Valery I. Chani, Masanori Kitahara, Tetsuo Kudo, Kei Kamada, Shunsuke Kurosawa, Andrey Medvedev, Vladimir Kochurikhin

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

22. Crystal Growth And Scintillation Properties Of Lu Substituted CeBr3 Single Crystals

Tomoki Ito, Yuui Yokota, Shunsuke Kurosawa, Kei Kamada, Jan Pejchal, Yuji Ohashi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

23. Crystal Growth Of 2inch Eu-Doped SrI2 Single Crystals For Scintillator Application

Akira Yoshikawa, Yasuhiro Shoji, Yuui Yokota, Shunsuke Kurosawa, Shoki Hayasaka, Valery I. Chani, Tomoki Ito, Kei Kamada, Yuji Ohashi, Vladimir V. Kochurikhin

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral /invited)

24. Czochralski Growth Of 2inch Ce-Doped (La,Gd)2Si2O7 Single Crystals For Scintillator Application

Akira Yoshikawa, Shunsuke Kurosawa, Yasuhiro Shoji, Valery I. Chani, Rikito Murakami, Kei Kamada, Yuui Yokota, Yuji Ohashi, Vladimir Kochurikhin

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral)

25. Luminescent Properties Of Cr-Doped Gallium Garnet Crystals Grown By The Micro Pulling Down Method

Shunsuke Kurosawa, Akira Suzuki, Akihiro Yamaji, Kei Kamada, Jan Pejchal, Yuji Ohashi, Yuui Yokota, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

26. Ca3NbGa3Si2O14 Piezoelectric Fiver Crystal For Electrical Generation From Oscillation Grown By Micro-Pulling-Down Mathod

Masanori Kitahara, Yuui Yokota, Yuji Ohashi, Andrey Medvedev, Syunsuke Kurosawa, Kei Kamada, Osamu Eguchi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral)

27. Growth Of 3 Inch Diameter Ce Doped Gd3Ga3Al2O12 Single Crystal Scintillator

Kei Kamada, Yasuhiro Shoji, Vladimir V. Kochurikhin, Aya Nagura, Satoshi Okumura, Seiichi Yamamoto, Shunsuke Kurosawa, Jan Pejchal, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral)

28. Chemical Composition Characterization Of Ca3Ta(Ga0.5Al0.5)3Si2O14 Single Crystal By The Line-Focus-Beam Ultrasonic Material Characterization System

Yuji Ohashi, Tetsuo Kudo, Yuui Yokota, Yasuhiro Shoji, Shunsuke Kurosawa, Kei Kamada, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

29. Scintillation Properties Of Ce:Gd3(Ga,Al)5O12 Single Crystals Grown By Czochralski Method With Different Mg Co-Doping Concentrations

Kei Kamada, Aya Nagura, Martin Nikl, Satoshi Okumura, Seiichi Yamamoto, Shunsuke Kurosawa, Yuui Yokota, Jan Pejchal, Yuji Ohashi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

30. Growth And Scintillation Properties Of Alkali Metal And Ce Co-Doped Lu3Al5O12 Scintillator

Kei Kamada, Vladimir V. Kochurikhin, Martin Nikl, Shunsuke Kurosawa, Jan Pejchal, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral)

31. Growth And Scintillation Properties Of Ce Doped YAG Single Crystal

Yuui Yokota, Shunsuke Kurosawa, Yuji Ohashi, Kei Kamada, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

32. Growth Of Ca3NbGa3Si2O14 Piezoelectric Crystals Grown From Congruent Composition

Yuui Yokota, Yuji Ohashi, Shunsuke Kurosawa, Kei Kamada, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Poster)

33. Growth Of N-Benzyl-2-Methyl-4-Nitroaniline (BNA) Single Crystal Fiber For Terahertz Generation

Kei Kamada, Yuma Takida, Hiroaki Minamide, Shunsuke Kurosawa, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa

2015 ACCGE-20

Aug. 2-7. 2015 / Big Sky, Montana, USA

(Oral)

34. Crystal Growth, Optical And Scintillation Properties of Bulk Eu-doped SrI2 Single Crystals

Akira Yoshikawa, Yasuhiro Shoji, Yuui Yokota, Shunsuke Kurosawa, Valery I. Chani, Tomoki Ito,

Kei Kamada, Yuji Ohashia, Vladimir Kochurikhin
The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)
Aug. 30- Sept. 4. 2015 / Budva, Montenegro
(Oral / invited)

35. Co-doping Effects on Luminescence and Scintillation Properties of Ce doped (Lu,Gd)3(Ga,Al)5O12 Scintillator

Hiroaki Yamaguchi, Kei Kamada, Shunsuke Kurosawa, Jan Pejchal, Yasuhiro Shoji, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa
The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)
Aug. 30- Sept. 4. 2015 / Budva, Montenegro
(Oral)

36. Growth and Luminescence Properties Of Ce doped LaCl3/CaCl2 Eutectic Scintillator

Kei Kamada, Kosuke Hishinuma, Shunsuke Kurosawa, Akihiro Yamaji, Yasuhiro Shoji, Jan Pejchalb, Yuji Ohashi, Yuui Yokota, and Akira Yoshikawa
The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)
Aug. 30- Sept. 4. 2015 / Budva, Montenegro
(Poster)

37. Growth and Scintillation Properties of Eu and Tb Doped LiGdF4/LiF Eutectic Scintillator for Neutron Detection

Kei Kamada, Kosuke Hishinuma, Shunsuke Kurosawa, Akihiro Yamaji, Yasuhiro Shoji, Jan Pejchal, Yuji Ohashi, Yuui Yokota, and Akira Yoshikawa
The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)
Aug. 30- Sept. 4. 2015 / Budva, Montenegro
(Poster)

38. Temperature Dependence of Y-Admix GAGG Scintillator Grown by the Czochralski Process

Shunsuke Kurosawa, Mafuyu Seki, Kei Kamada, Jan Pejchal, Yasuhiro Shoji, Yuji Ohashi, Yuui Yokota, Akira Yoshikawa
The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)
Aug. 30- Sept. 4. 2015 / Budva, Montenegro
(Poster)

39. ASSIGNMENT OF Nd3+/Yb3+ ENERGY LEVELS IN THE C2 AND C3i CENTERS OF Lu2O3 SESQUIOXIDE CERAMICS/CRYSTAL

Georges Boulon, Guillaume Alombert-Goget, Yannick Guyot, Malgorzata Guzik,Jan Pejchal, Akira Yoshikawa, Akihiko Ito, Takashi Goto

The 4TH International Conference on the Physics of Optical Materials and Devices (ICOM2015)

Aug. 30- Sept. 4. 2015 / Budva, Montenegro

(Oral / invited)

40. Band gap and defect engineering strategies in the Ce and Pr-doped complex oxide scintillators optimization

M. Nikl, K. Kamada, S. Kurosawa, J. Pejchal, V. Jary, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral / invited)

41. Growth and scintillation properties of alkali metal ions co-doped Ce:Gd3Ga3Al2O12

K. Kamada, V. V. Kochurikhin, M. Nikl, S. Okumura, S. Yamamoto, J. Y. Yeom, Y Shouji, S. Kurosawa, J. Pejchal, Yuui Yokota, Y. Ohashi, ○A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral)

42. Material design, crystal chemistry and crystal growth of high performance scintillators; GAGG, La-GPS, Eu:SrI2

A. Yoshikawa, M. Nikl, K. Kamada, S. Kurosawa, Y. Yokota, R. Murakami, T. Ito, Y. Ohashi, J. Pejchal, R. Kral

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral / invited)

43. Development of Cr-doped oxide crystals for red and near infra-red emission

scintillators by the Floating Zone method

S. Kurosawa, T. Shishido, A. Yamaji, R. Murakami, T. Horiai, T. Sugawara, A. Nomura, K. Yubuta, Y. Shoji, Y. Yokota, J. Pejchal, Y. Ohashi, K. Kamada, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral)

44. Luminescent properties of co-doping to SrHfO3 prepared by the spark plasma sintering method

H. Chiba, S. Kurosawa, R. Murakami, A.Yamaji, Y. Ohashi, J. Pejchal, K. Kamada, Y. Yokota, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral)

45. Effects of Pr doping on scintillation properties for CeBr3 crystals

T. Ito, Y. Yokota, S. Kurosawa, R. Kral, K. Kamada, J. Pejchal, Y. Ohashi, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Oral)

46. Comparison of Gd2YAl2Ga3O12:Ce and Lu2YAl2Ga3O12:Ce single crystals for gamma-ray detection

W. R. Chewpraditkul, N. Pattanaboonmee, W. Chewpraditkul, K. Kamada, A. Yoshikawa, M. Nikl

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

47. Luminescent properties of Ce-doped lutetium pyrosilicate scintillators

T. Horiai, S. Kurosawa, R. Murakami, A. Yamaji, Y. Shoji, Y. Ohashi, J. Pejchal, K. Kamada, Y. Yokota, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation

(LUMDETR 2015)
Sept. 20-25. 2015 / Tartu, Estonia
(Poster)

48. The effects on the non-proportionality response by co-doping alkali metal ions for Eu:SrI2 crystals grown by micro-pulling-down method

T. Ito, Y. Yokota, S. Kurosawa, R. Kral, K. Kamada, J. Pejchal, Y. Ohashi, A. Yoshikawa
9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)
Sept. 20-25. 2015 / Tartu, Estonia
(Poster)

49. Single crystal growth of Ce doped Ce:Gd3(Sc, Al)5O12 by Czochralski method and their scintillation properties

K. Kamada, V. V. Kochurikhin, A. Nagura, S. Kurosawa, J. Pejchal, Y. Yokota, Y. Ohashi, A. Yoshikawa
9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)
Sept. 20-25. 2015 / Tartu, Estonia
(Poster)

50. Luminescent properties of Ce and Sc-admix GPS Scintillator

S. Kurosawa, T. Shishido, R. Murakami, T. Horiai, T. Sugawara, A. Nomura, K. Yubuta, Y. Shoji, Y. Yokota, J. Pejchal, Y. Ohashi, K. Kamada, A. Yoshikawa
9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)
Sept. 20-25. 2015 / Tartu, Estonia
(Poster)

51. Scintillation Properties of Co-doped (La, Gd)2Si2O7 Crystal Grown by the Czochralski Method

R. Murakami, S. Kurosawa, Y. Shoji, V. Jary, Y. Ohashi, J. Pejchal, Y. Yokota, K. Kamada, M. Nikl, A. Yoshikawa
9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)
Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

52. Comparative studies of Gd3Al2.6Ga2.4O12:Ce and Gd3Al2Ga3O12:Ce single crystal scintillators for gamma-ray detection

O. Sakthong,W. Chewpraditkul, T. Szczesniak, M. Moszynski, A. Yoshikawa, K. Kamada, M. Nikl

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

53. Growth and scintillation properties of Sn-doped LiF and LiCaAlF6 neutron scintillation crystals

C. Tanaka, Y. Yokota, S. Kurosawa, A. Yamaji, V. Jary, V. Babin, J. Pejchal, Y. Ohashi, K. Kamada, M. Nikl, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

54. Ce-concentration dependence of scintillation characteristics for Ce-doped (Gd, La)2Si2O7 doped grown by the Czochralski process

S. Kurosawa, Y. Shoji, R. Murakami, T. Horiai, K. Kamada, J. Pejchal, Y. Ohashi, A. Yoshikawa

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

55. Optical properties of large-size ceramic scintillators including hafnium prepared by the spark plasma sintering process

S. Kurosawa, K. Harata, H. Chiba, K. Kamada, J. Pejchal, Y. Ohashi, A. Yoshikawaz

9th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation (LUMDETR 2015)

Sept. 20-25. 2015 / Tartu, Estonia

(Poster)

56. Growth and scintillation properties of Europoium doped eutectic scintillator

Kei Kamada, Kosuke Hishinuma, Shunsuke Kurosawa, Akihiro Yamaji, Yasuhiro Shoji, Jan Pejchal, Yuui Yokota, Yuji Ohashi, and Akira Yoshikawa
4th International Conference on RARE EARTH MATERIALS (REMAT)
Oct. 26-28. 2015 / Wroclaw, Poland
(Poster)

57. Temperature depdence of opitcal propetirs of rare earth doped LaF3

Shunsuke Kurosawa, Kei Kamada, Yasuhiro Shoji, Akihiro Yamaji, Rikito Murakami, Takahiko Horiai, Hiroyuki Chiba, Yuji Ohashi, Yuui Yokota, Akira Yoshikawa
4th International Conference on RARE EARTH MATERIALS (REMAT)
Oct. 26-28. 2015 / Wroclaw, Poland
(Poster)

58. Measurements of Acoustical Physical Constants for Ca3Nb(Ga0.75Al0.25)3Si2O14 Single Crystal Using the Ultrasonic Microspectroscopy System

Yuji Ohashi, Yuui Yokota, Tetsuo Kudo, Shunsuke Kurosawa, Kei Kamada, Akira Yoshikawa
2015 IEEE International Ultrasonics Symposium (IUS)
Oct. 21-24. 2015 / Taipei, Taiwan
(Poster)

59. Evaluation of Acoustic Properties of CaTiO3-(K,Na)NbO3 Film Using Microfabricated Structure

Ryosuke Kaneko, Michio Kadota, Yuji Ohashi, Jun-ichi Kushibiki, Shinsuke Ikeuchi, Shuji Tanaka
2015 IEEE International Ultrasonics Symposium (IUS)
Oct. 21-24. 2015 / Taipei, Taiwan
(Oral)

60. Luminescence Properties of M/Ce Co-Doped GAGG Scintillator Grown by the Micro-Pulling-Down Method (M=Hf,Zr)

Y. Shoji, S. Kurosawa, K. Kamda, R. Murakami, H. Yamaguchi, J. Pejchal, Y. Ohashi, Y. Yokota, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

61. Luminescent Properties of Rare Earth Doped La-GPS Crystals Grown by the Floating Zone Method

Y. shoji, S. Kurosawa, T. Shishido, T. Sugawara, A. Nomura, K. Yubuta, R. Murakami, T. Horiai, J. Pejcal, Y, Ohashi, K. Kamada, Y. Yokota, A. Yoshikawa

2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)

Nov. 1-7. 2015 / SanDiego,CA,USA

(Poster)

62. Luminscent Properties of Hafnate Transparent Ceramics Prepared by the SPS Method

S. Kurosawa, K. Harata, H. Chiba, J. Pejachal, Y. Ohashi, K. Kamada, Y. Yokota, A. Yoshikawa

2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)

Nov. 1-7. 2015 / SanDiego,CA,USA

(Poster)

63. Radiation Hardness of Ce:GAGG and Ce:La-GPS Irradiated with Proton Beam

S. Kurosawa, R. Murakami, A. Yamaji, T. Horiai, H. Chiba, H. Yamaguchi, Y. Shoji, J. Pejchal, Y. Ohashi, Y. Yokota, K. Kamada, A. Yoshikawa

2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)

Nov. 1-7. 2015 / SanDiego,CA,USA

(Poster)

64. Scintillation Properties of 2-inch Ce:(La,Gd)2Si2O7 Crystals Grown by the Czochralski Process

S. Kurosawa, Y. Shoji, R. Murakami, T. Horiai, Y. Ohashi, J. Pejchal, Y. Yokota, K. Kamada, A. Yoshikawa

2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE

NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

65. Development of Yb-Doped Oxide Scintillators for Infla-Red Application

A. Yoshikawa, S. Kurosawa, A. Yamaji, A. Suzuki, Y. Yokota, K. Kamada
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

66. Scintillation Properties of Pr Doped CeBr3 Crystals

A. Yoshikawa, T. Ito, T. Tokota, S. Kurosawa, Y. Ohashi, K. Kamada
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

67. Scintillation Properties of Large-Size Eu-Doped SrI2 Single Crystals and Its Application

Y. Shoji, Y. Yokota, S. Kurosawa, S. Hayasaka, I. Chiba, V. I. Chani, V. Kochurikhin, T. Ito, J. Pejchal, Y. Ohashi, K. Kamada, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

68. Scintillation Properties of Cr-Doped Oxide Crystal in the Infra-Red Region

S. Kurosawa, A. Yamaji, T. Shishido, A. Suzuki, T. Sugawara, A. Nomura, K. Yubuta, J. Pejchal, Y. Yokota, K. Kamada, V. Kochurikhin, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)

Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

69. Scintillation Properties of Ce:(La,Gd)2Si2O7 Single Crystals Co-Doped by Divalent-Ions and Grown by the Czochralski Process

R. Murakami, S. ?Kurosawa, Y. Shoji, M. Kitaura, Y. Ohashi, J. Pejchal, K. Kamada, A. Ohnishi, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

70. Growth and Scintillation Proerties of Sr3NbGa3Si2O14 and Sr3TaGa3Si2O14 Single Crystals

Y. Yokota, S. Kurosawa, Y. Ohashi, K. Kamada, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

71. Czochralski Growth and Scintillation Properties of 3 Inch Size Mg2+ Co-Doped Ce:Gd3Ga3Al2O12 Single Crystal

K. Kamada, Y. Shoji, V. Kochurikhin, A. Nagura, S. Okumura, S. Yamamoto, J. Y. Yeom, S. Kurosawa, J. Pejchal, Y. Yokota, Y. Ohashi, M. Nikl, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

72. Growth and Scintillation Properties of Phase-Separated Scintillator Fibers Using Ternary Fluoride Eutectic Phase

K. Kamada, K. Hishinuma, S. Kurosawa, A. Yamaji, Y. Yokota, Y. Ohashi, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the

Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

73. Growth and Scintillation Properties of Ce Doped Gd3(Sc,Al)5O12 Single Crystal

K. Kamada, V. Kochurikhin, A. Nagura, S. Kurosawa, Y. Yokota, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

74. Crystal Growth and Scintillation Properties of Pr Doped SrI2 Single Crystals

Y. Yokota, T. Ito, S. Kurosawa, R. Kral, Y. Ohashi, K. Kamada, A. Yoshikawa
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

75. Evaluation of New Inorganic Scintillators for High Performance ToF PET Applications

V. Sanchez-Tembleque, L. M. Fraile, V. Vedia, M. Carmona, K. Kamada, Y. Shoji, A. Yoshikawa, (*)J. M. Udias
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Oral)

76. Growth and Scintillation Propeties of Sn-Doped LiF and LiCaAlF6 Single Crystals for Neutron Scintillator

Y. Yokota, C. Tanaka, S. Kurosawa, A. Yamaji, V. Jary, V. Babin, J. Pejchal, Y. Ohashi, K. Kamada, M. Nikl, A. Yoshikawa

2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Poster)

77. A Handheld Gamma Imaging Probe for Intraoperative Use in Radio-Guided Cancer Surgery

Y. Qi, G.Bizzozero, P. Ihnat, M. Petasecca, M. Lerch, S. Meikle, K. Kamada, Y. Shoji, A. Yoshikawa, A. Rosenfeld
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Oral)

78. Growth and Scintillation Properties of Ce Doped Gd2Si2O7/SiO2 Eutectic as Phase Separated Scintillators for High Resolution Imaging

A. Yoshikawa, K. Kamada, S. Kurosawa, Y. Yokota, Y. Ohashi
2015 IEEE Nuclear Science Symposium and Medical Imaging Conference together with the Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors (IEE NSS/MIC/RTSD 2015)
Nov. 1-7. 2015 / SanDiego,CA,USA
(Oral)

79. Improvement of Dopant Distribution on the Ce:Y3Al5O12 Single Crystals Grown by Micro-Pulling down Method

Y. Yokota, Z. Zeng, Y. Ohashi, S. Kurosawa, K. Kamada, Y. Kawazoe, A. Yoshikawa
The 8th International Workshop on Modeling in Crystal Growth (IWMCG-8)
Nov. 15-18. 2015 / Spa, Belgium
(Poster)

80. Over view of novel scintillation materials and its applications -FY2015-

Akira Yoshikawa, Yuui Yokota, Kei Kamada, Shunsuke Kurosawa, Yuji Ohashi, Yasuhiro Shoji, Shoki Hayasaka, Hisakazu Nagato, Akihiro Yamaji, Tetsuo Kudo, Tomoki Ito, Rikito Murakami, Aya Nagura, Chieko Tanaka, Hiroyuki Chiba, Takahiko Horiai, Hiroaki Yamaguchi

The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

81. Radiation Hardness of Ce:(La, Gd)_2Si_2O_7 Scintillator

Shunsuke Kurosawa, Rikito Murakami, Akihiro Yamaji, Yasuhiro Shoji, Jan Pejchal, Yuji Ohashi, Yuui Yokota, Kei Kamada, Akira Yoshikawa
the First International Symposium on Radiation Detectors and Their Uses (ISRD2016)
Jan. 18-21. 2015 / Tsukuba, Japan
(Oral)

82. Temperature dependence of luminescence properties for gadolinium-pyrosilicate scintillator

T. Horiai, S. Kurosawa, R. Murakami, A. Yamaji, Y. Shoji, Y. Ohashi, J. Pejchal, K. Kamada, Y. Yokota and A. Yoshikawa
the First International Symposium on Radiation Detectors and Their Uses (ISRD2016)
Jan. 18-21. 2015 / Tsukuba, Japan
(Poster)

83. Crystal growth and basic scintillation properties of Yb:LuF3 single crystal

Chieko Tanaka, Yuui Yokota, Shunsuke Kurosawa, Jan Pejchal, Rikito Murakami, Takahiko Horiai, Hiroyuki Chiba, Yuji Ohashi, Kei Kamada and Akira Yoshikawa
the First International Symposium on Radiation Detectors and Their Uses (ISRD2016)
Jan. 18-21. 2015 / Tsukuba, Japan
(Poster)

84. Optical and Scintillation Properties of Pr doped SrI2 Single Crystals Grown by Modified Micro-Pulling-Down Method

Yuui Yokota, Shunsuke Kurosawa, Yuji Ohashi, Kei Kamada, Akira Yoshikawa
The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

85. Growth and Luminescence Properties of Ce Doped LaCl3/CaCl2

Kei Kamada, Kosuke Hishinuma, Shunsuke Kurosawa, Akihiro Yamaji, Yasuhiro Shoji, Yuji Ohashi, Yuui Yokota, and Akira Yoshikawa

The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

86. Luminescent study on Zr Co-doped (La, Gd)2Si2O7 Crystal Grown by the Czochralski Method

R. Murakami, S. Kurosawa, Y. Shoji, V. Jary, Y. Ohashi, J. Pejchal, Y. Yokota, K. Kamada, M. Nikl, A. Yoshikawa
The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

87. Co-doping Effect of Ce:SrHfO3 Transparent Ceramics on Optical and Luminescent Properties

H.Chiba, S.Kurosawa, R.Murakami, A.Yamaji, Y.Ohashi, Jan.Pejachal, K.Kamada, Y.Yokota, A. Yoshikawa
The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

88. Luminescence study on Ce-doped lutetium pyrosilicate crystals

T. Horiai, S. Kurosawa, R. Murakami, A. Yamaji, Y. Shoji, Y. Ohashi, J. Pejchal, K. Kamada, Y. Yokota and A. Yoshikawa
The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

89. Co-doping effects on luminescence and scintillation properties of Ce doped (Lu,Gd)3(Ga,Al)5O12 crystals grown by the micro-pulling-down method

Hiroaki Yamaguchi, Kei Kamada, Shunsuke Kurosawa, Jan Pejchal, Yasuhiro Shoji, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa
The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)
Dec. 5-6. 2015 / Oarai, Japan
(Poster / mini Oral)

90. Growth and Scintillation properties of Sn or Pb doped LiCaAlF6 single crystals

for neutron scintillator

C. Tanaka, Y. Yokota, S, Kurosawa, A. Yamaji, V. Jary, V. Babin, J. Pejchal, Y. Ohashi. K. Kamada, M. Nikl, A. Yoshikawa

The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)

Dec. 5-6. 2015 / Oarai, Japan

(Poster / mini Oral)

91. Development of an Imaging Detector with Red/infrared Scintillator

S. Kurosawa, A. Yamaji, R. Murakami, Y. Shoji, Y. Ohashi, ?Y. Yokota, K. Kamada, A. Yoshikawa

The 10th International Workshop on Ionizing Radiation. Monitoring (IWIRM10)

Dec. 5-6. 2015 / Oarai, Japan

(Poster / mini Oral)

92. Crystal Growth and piezoelectric properties of Ca3Ta(Ga1-xAlx)3Si2O14 single crystals

T.Kudo, Y.Yokota, Y.Ohashi, Y.Shoji, K.Kamada, A.Medovedev, V.Kochurikhin, S.Kurosawa, A.Yoshikawa

The Collaborative Conference on Crystal Growth (3CG 2015)

Nov. 14-17. 2015 / Hong Kong, China

(Oral / invited)

93. Development of a Position-Sensitive Gamma-ray Camera Using Novel Scintillator and an MPPC

S. Kurosawa, Y. Shoji, R. Murakami, T. Horiai, A. Yamaji, H. Chiba, ?Y. Ohashi, K. Kamada, Y. Yokota, A. Yoshikawa

The 14th Vienna Conference on Instrumentation (VCI2016)

Nov. 15-19. 2015 / Vienna, Austria

(Poster)

94. Design of Novel Scintillator Crystals And Their Crystal Growth Technologies

Akira Yoshikawa, Kei Kamada, Shunsuke Kurosawa, Yuui Yokota, Yuji Ohashi, Yasuhiro Shoji, Valery I. Chani, Vladimir V. Kochurikhin, Martin Nikl

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Oral / invited)

95. Vacuum Ultraviolet Light Source and Photodetector Based on Fulorides

Shingo Ono, Masaki Tanemura, Kentaro Fukuda, Suyama Toshihisa, Takayuki Yanagida, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Oral / invited)

96. Growth And Scintillation Properties of Halide Scintillator Single Crystals Growth by Modified Micro-Pulling-Down Method

Yuui Yokota, Shunsuke Kurosawa, Yuji Ohashi, Kei Kamada, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Oral / invited)

97. Co-Doping Effects on Luminescence And Scintillation Properties of Ce Doped Lu3(Ga,Al)5O12 Scintillator

Hiroaki Yamaguchi, Kei Kamada, Shunsuke Kurosawa, Jan Pejchal, Yasuhiro Shoji, Yuui Yokota, Yuji Ohashi, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Oral)

98. Large Size Czochralski Growth and Scintillation Properties of Li+ Co-Doped Ce:Gd3Ga3Al2O12 Single Crystals

Kei Kamada, Yasuhiro Shoji , Vladimir V. Kochurikhin Aya Nagura, Satoshi Okumura, Seiichi. Yamamoto, Jung Yeol Yeom, Shunsuke Kurosawa, Jan Pejchal, Yuui Yokota,Yuji Ohashi, Martin Nikl, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Oral)

99. Growth and Scintillation Properties of Eu Doped LiSrI3/LiI Eutectic Scintillator

Kei Kamada, Yasuhiro Shoji , Shunsuke Kurosawa, Yuui Yokota,Yuji Ohashi, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Poster)

100. Crystal growth and luminescence properties of Tb,Ce co-doped (Gd,La)2Si2O7

Rikito Murakami, Shunsuke Kurosawa, Yasuhiro Shoji, Jan Pejchal, Yuji Ohashi, Yuui Yokota, Kei Kamada, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Poster)

101.Temperature-dependence of Ce-doped (La0.4, Gd0.6)2Si2O7 scintillators

Takahiko Horiai, Shunsuke Kurosawa, Rikito Murakami, Akihiro Yamaji, Yasuhiro Shoji, Yuji Ohashi, Jan Pejchal, Kei Kamada, Yuui Yokota, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Poster)

102. Crystal Growth, Optical and Scintillation Properties of In Doped LiCaAlF6 Single Crystals For Neutron Scintillator

Chieko Tanaka, Yuui Yokota, Shunsuke Kurosawa, Akihiro Yamaji, Vitezslav Jary, Vladimir Babin, Jan Pejchal, Yuji Ohashi, Kei Kamada, Martin Nikl, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Poster)

103. Evaluation of Electron Damage for Ce:La-GPS Scintillator

Shunsuke Kurosawa, Rikito Murakami, Takahiko Horiai, Hiroyuki Chiba, Akihiro Yamaji, Yasuhiro Shoji, Yuji Ohashi, Kei Kamada, Yuui Yokota, Akira Yoshikawa

The 7TH International Symposium on Optical Materials (IS-OM7)

Feb. 29- Mar. 4. 2016 / Lyon, France

(Poster)

104. Band Gap and Defect Engineering Strategies in the Complex Oxide Scintillators Optimization: The Differences For Ce and Pr-Doping

Martin Nikl

The 7TH International Symposium on Optical Materials (IS-OM7)

The 7TH International Symposium on Optical Materials (IS-OM7)
Feb. 29- Mar. 4. 2016 / Lyon, France
(Oral / invited)

105. Luminescent Study on Rare Earth Doped Hafnium Based Transparent Ceramics Prepared by Spark Plasma Sintering Method

Shunsuke Kurosawa, Koichi Harata, Hiroaki Chiba, Yuji Ohashi, Kei Kamada, Yuui Yokota, Akira Yoshikawa
The 7TH International Symposium on Optical Materials (IS-OM7)
Feb. 29- Mar. 4. 2016 / Lyon, France
(Oral / invited)

国内学会

1. 真空紫外域に発光する新規発光結晶の開発 (2014)

吉川 彰, Pejchal Jan, ○黒澤 俊介, 山路 晃広
レーザー研シンポジウム 2015－平成 26 年度共同研究成果報告会－
2015/04/08-09 / 大阪大学レーザー研
（ポスター発表）

2. 可視・紫外域での酸化物発光材料のエネルギー輸送に関する研究

横田 有為、 ○黒澤 俊介、鎌田 圭、Pejchal Jan
レーザー研シンポジウム 2015－平成 26 年度共同研究成果報告会－
2015/04/08-09 / 大阪大学レーザー研
（ポスター発表）

3. Ca3B(Ga1-xAlx)3Si2O14 [B = Nb,Ta]のバルク単結晶育成とその特性評価

横田有為, 工藤哲男, 大橋雄二, Andrey Medvedev, 黒澤俊介, 鎌田圭, 吉川彰
第 32 回 強誘電体応用会議（FMA32）
2015/05/20-23 / コープイン京都
（口頭発表）

4. Ce 添加(Gd, La)2Si2O7 ガドリニウムベースのシンチレータ開発とその発光特性

黒澤俊介
2015/07/21 / 山形大学セミナー

（口頭発表）

5. 平面超音波材料解析システムによる Ca3Nb(Ga0.75Al0.25)3Si2O14 単結晶の音波関連物理定位数の測定

大橋雄二、横田有為、工藤哲男、黒澤俊介、鎌田圭、吉川彰

76ｔｈ,応用物理学会秋季学術講演会

2015/09/13-16 / 名古屋国際会議場

（口頭発表）

6. Sn 添加 LiCaAlF6 中性子シンチレータ単結晶の結晶育成とシンチレーション特性評価

田中智恵子、横田有為、黒澤俊介、山路晃広、Vitezslav Jary、Vladimir Babin、Jan Pejchal、大橋雄二、鎌田圭、Martin Nikl、吉川彰

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7. CeBr3 シンチレータ単結晶における Lu 置換効果

伊藤友樹、横田有為、黒澤俊介、鎌田圭、Pejchal Jan、大橋雄二、吉川彰

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8. Ce 添加 LaCl3/CaCl2 共晶体の作製とシンチレーション特性評価

鎌田圭、菱沼康介、黒澤俊介、庄子育宏、横田有為、大橋雄二、吉川彰

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9. Ca3Ta(Gax,Al1-x)3Si2O14 圧電単結晶の育成と圧電特性における Al 置換効果

工藤哲男、横田有為、大橋雄二、庄子育宏、鎌田圭、黒澤俊介、吉川彰

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10. Ca3Nb(Ga,Al)3Si2O14 の結晶育成とその物性評価

横田有為、大橋雄二、工藤哲男、黒澤俊介、鎌田圭、吉川彰
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11. 長尺 Ca3NbGa3Si2O14 圧電結晶の育成
北原正典、大橋雄二、横田有為、工藤哲男、鎌田圭、黒澤俊介、吉川彰
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12. アルカリ金属共添加 Ce:Gd3Ga3Al2O12 シンチレータの作製とシンチレーション特性評価
鎌田圭、庄子育宏、奥村聡、山本誠一、Yeom Jung Yeol, Kochurikhin Vladimir V.、黒澤俊介、横田有為、大橋雄二、吉川彰
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13. 1 および 2 インチ径 La-GPS 単結晶のシンチレーション特性評価
黒澤俊介、庄子育宏、村上力輝斗、堀合毅彦、山路晃広、大橋雄二、横田有為、鎌田圭、吉川彰
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14. Ce 添加(Lu,Gd)3(Ga,Al)5O12 シンチレータにおける発光およびシンチレータ特性に及ぼす共添加効果
山口大聡、鎌田圭、黒澤俊介、庄子育宏、横田有為、Jan Pejchal、大橋雄二、吉川彰
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15. Ti 添加ガーネット酸化物シンチレータ結晶の近赤外発光特性
山路晃広、黒澤俊介、村上力輝斗、大橋雄二、鎌田圭、横田有為、吉川彰
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16. 77K における GAGG 結晶のγ線応答とシンチレーション発光波長分布の測定

木佐優太、前畑京介、鎌田圭、庄子育宏、吉川彰、安宗貴志、
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17. SPS 法により作製した共添加 Ce:SrHfO3 透光性セラミックスの光学特性

知場啓志、黒澤俊介、原田晃一、村上力輝斗、山路晃広、大橋雄二、横田有為、吉川彰、Jan Pejchal、鎌田圭
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2015/09/16-18 / 富山大学（五福キャンパス）
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18. 遷移金属添加（La,Gd）2Si2O7 焼結体の発光特性

村上力輝斗、黒澤俊介、庄子育宏、大橋雄二、横田有為、鎌田圭、吉川彰、Jan Pejchal
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19. Ce 賦活パイロシリケート型結晶の発光特性

堀合毅彦、黒澤俊介、村上力輝斗、山路晃広、庄子育宏、大橋雄二、鎌田圭、横田有為、吉川彰、Jan Pejchal
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20. SPS 法によるシンチレータ材料の開発 IV

黒澤俊介、原田晃一、知場啓志、村上力輝斗、堀合毅彦、山路晃広、Jan Pejchal、大橋雄二、鎌田圭、横田有為、吉川彰
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21. ランガサイト型圧電結晶のこれまでの開発と今後の展開

横田有為、大橋雄二、工藤哲男、Andrey Medvedev、黒澤俊介、鎌田圭、吉川彰、庄子育宏、井上憲司、小野寺晃

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22. SMILE24 : 電子飛跡検出型コンプトンカメラが持つ偏光撮像性能の評価試験

古村翔太郎, 谷森達, 窪秀利, 高田淳史, Parker Joseph, 水村好貴, 水本哲矢, 園田真也, 友野大, 中村輝石, 松岡佳大, 中村祥吾, 岸本哲朗, 小田真, 竹村泰斗, 宮本奨平, 身内賢太朗, 澤野達哉, 黒澤俊介

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23. SMILE25：電子飛跡検出型コンプトンカメラ(ETCC)の電子飛跡解析方法改善によるイメージングの改善

宮本奨平, 谷森達, 窪秀利, 高田淳史, Parker Joseph, 水村好貴, 水本哲矢, 園田真也, 友野大, 岩城智, 中村輝石, 松岡佳大, 古村翔太郎, 中村祥吾, 岸本哲郎, 小田真, 竹村泰斗, 身内賢太朗 A, 澤野達哉, 黒澤俊介

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24. SMILE26：ETCC の散乱平面決定精度の効果と到達予想感度

高田淳史, 谷森達, 窪秀利, Parker Joseph, 水村好貴, 水本哲矢, 園田真也, 友野大, 岩城智, 中村輝石, 松岡佳大, 古村翔太郎, 中村祥吾, 岸本哲郎, 小田真, 竹村泰斗, 宮本奨平, 身内賢太朗, 澤野達哉, 黒澤俊介

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25. 方向感度をもつ暗黒物質検出器の開発をめざした異方性を有するシンチレータ開発の検討

黒澤俊介、関谷洋之、村上力輝斗、庄子育宏、大橋雄二、鎌田圭、横田有為、吉川彰

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2015/09/25-28 / 大阪市大
（口頭発表）

26. Mg 共添加 Ce:Gd3(Al,Ga)5O12 シンチレータの大型化とシンチレーション特性評価

鎌田圭、庄子育宏、名倉亜耶、奥村聡、山本誠一、Jung Yeol Yeom、Vladimir V. Kochurikhin、黒澤俊介、横田有為、大橋雄二、吉川彰
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2015/10/19-21 / 北海道大学学術交流会館
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27. Mg 共添加 Ce:(Lu,Gd)3(Ga,Al)5O12 結晶のマイクロ引き下げ法による育成と評価

山口大聡、鎌田圭、黒澤俊介、庄子育宏、横田有為、大橋雄二、吉川彰
第 45 回結晶成長国内会議（NCCG-45）
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28. 高融点金属ファイバー結晶の製造技術開発

横田有為、田中邦弘、坂入弘一、黒澤俊介、大橋雄二、吉川彰
第 45 回結晶成長国内会議（NCCG-45）
2015/10/19-21 / 北海道大学学術交流会館
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29. 新規単結晶材料の開発とその実用化に関する研究

吉川彰
第 45 回結晶成長国内会議（NCCG-45）
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（口頭発表）

30. 浮遊帯溶融法による(Gd1- x Cex)2Si2O7 単結晶の育成

松家康平、長尾雅則、綿打敬司、田中功、黒澤俊介、横田有為、吉川彰
第 45 回結晶成長国内会議（NCCG-45）
2015/10/19-21 / 北海道大学学術交流会館
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31. LiCaAlF6 シンチレータ単結晶における新規発光中心の検討

田中智恵子、横田有為、黒澤俊介、山路晃広、Vitezslav Jary、Vladimir Babin、Jan Pejchal、大橋雄二、鎌田圭、Martin Nikl、吉川彰

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32. ランガサイト型圧電単結晶のマイクロ引き下げ法による育成および評価

北原 正典, 大橋 雄二, 横田 有為, 井上 憲司, 工藤 哲男, 鎌田 圭, 黒澤 俊介, 吉川 彰

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33. Ca3Ta(Ga1-xAlx)3Si2O14 単結晶の音響特性における Al 置換量依存性

大橋 雄二, 工藤 哲男, 横田 有為, 庄子育宏, 黒澤 俊介, 鎌田 圭, 吉川 彰

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（ポスター発表）

34. 長時間気球による MeV ガンマ線天文学の開拓

高田淳史, 谷森達, 窪秀利, 水本哲矢, 水村好貴, 古村翔太郎, 岸本哲朗, 竹村泰斗, 宮本奨平, 中増勇真, 吉川慶, 黒澤俊介, 澤野達哉

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35. 高性能シンチレータの開発動向

吉川彰

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36. 新規シンチレータ結晶の開発と世界の動向

吉川彰

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37. ハロゲン化物シンチレータ単結晶の作製技術開発

横田 有為、 黒澤 俊介、鎌田 圭、伊藤 友樹、大橋 雄二、吉川 彰、庄子 育宏
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（口頭発表）

38. マイクロ引き下げ法を用いた CeBr3 単結晶の作製と Pr 添加効果

伊藤 友樹、横田 有為、黒澤 俊介、鎌田 圭、Pejchal Jan、Rober Kral、大橋 雄二、鎌田 圭、吉川 彰
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39. 無添加Ｙｂ2Si2O7 シンチレータの近赤外発光特性

堀合 毅彦、黒澤 俊介、村上 力輝斗、大橋 雄二、鎌田 圭、横田有為、吉川 彰
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40. ペロブスカイト型化合物 RRh3B(R= 希土類元素)の合成、単結晶育成および評価

宍戸 統悦、湯蓋 邦夫、森 孝雄、田中 雅彦、岡田 繁、山崎 貴、野村 明子、菅原 孝昌、佐原 亮二、林 好一、澤田 豊、手嶋 勝弥、大石 修治、川添 良幸、吉川 彰
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41. ペロブスカイト型固溶体 RRh3B1-xCx(R= 希土類元素, 0≦ x ≦1)の合成と評価

宍戸 統悦、湯蓋 邦夫、森 孝雄、田中 雅彦、岡田 繁、野村 明子、菅原 孝昌、吉川 彰
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42. 高エネルギー物理学実験に向けた新規結晶の開発の四方山話

黒澤俊介

東北大学 ニュートリノセンター

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43. Lu2Si2O7 シンチレータ結晶の Yb 置換効果とその発光特性

堀合毅彦、 黒澤俊介, 村上力輝斗, 山路晃広, 庄子育宏, 大橋雄二, Pejchal Jan, 鎌田 圭, 横田有為, 吉川 彰

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44. ヨウ化ストロンチウムシンチレータ結晶の大型化と発光特性

黒澤俊介, 横田有為, 庄子育宏, 長門久和, 早坂将輝, 大橋雄二, 鎌田 圭, 吉川彰

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45. 2 価陽イオン共添加 Ce:(Gd, La)2Si2O7 単結晶の シンチレーション特性

村上力輝斗, 黒澤俊介, 庄子育宏, 横田有為, Jan Pejchal, 大橋雄二, 鎌田 圭, 吉川 彰

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46. Growth and luminescence propertirs of Ce doped LaCl3/CaCl2?eutectic scintillator

Kei Kamada, Kosuke Hishinuma, Yasuhiro Shoji, Shunsuke Kurosawa, Akihiro Yamaji, Yuui Yokota,Yuji Ohashi, Akira Yoshikawa

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47. SPS 法によるシンチレータ材料の開発 V

黒澤俊介、原田晃一、知場啓志、村上力輝斗、堀合毅彦、山路晃宏、Pejchal Jan、大橋雄二、

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日本セラミックス協会 2016 年年会
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（口頭発表）

48. 相分離構造を有する超高解像度シンチレータ
安居伸浩、大橋良太、鎌田 圭、吉川 彰、田透
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49. 超高解像度相分離シンチレータを用いた位相格子の自己像直接撮像による X 線位相イメージング
大橋良太、安居伸浩、鎌田圭、吉川彰、田透
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50. マイクロ引き下げ法で作製した Ce:Y3Al5O12 単結晶における面内 Ce 偏析の改善
横田有為、ZengZhong、大橋雄二、黒澤俊介、鎌田圭,、川添良幸、吉川彰
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51. 集束ビーム超音波材料解析システムを用いた X-cut ランガサイト型単結晶の方位決定の実験的検討
大橋雄二、横田 有為、工藤 哲男、庄子 育宏、鎌田 圭,、黒澤 俊介、吉川 彰
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52. Ca3Ta(Ga1-xAlx)3Si2O14(x=0,0.25,0.5,0.75)圧電単結晶における音響特性の Al 置換量依存性
工藤哲男、○横田有為、大橋雄二、庄子育宏,、鎌田圭、黒澤俊介、吉川彰
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53. 77 K における GAGG 結晶のγ線に対するシンチレーション応答測定
都留由紀子、前畑京介、木佐優太、鎌田圭、庄子育宏、吉川彰
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54. Mg 共添加 Ce:Lu3(Ga,Al)5O12 シンチレータの作製とシンチレーション特性評価
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JOURNAL OF LUMINESCENCE 169, 682, Published: JAN2016

Luminescence mechanism in doubly Gd, Nd-codoped fluoride crystals for VUV scintillators

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Abstract:

The Nd-doped, Gd-doped and doubly Nd, Gd-codoped $BaLu_{1.2}Y_{0.8}F_8$ (BaLuYF) and LuF_3 single crystals were grown by a micro-pulling-down method. Their photoluminescence, radioluminescence and alpha-ray-excited pulse-height spectra were studied in the vacuum-ultra-violet (VUV) region to confirm their possible application as fast VUV scintillators. Complementary photoluminescence measurements in the ultra-violet/visible spectral region were performed as well. The possibility of scintillation performance improvement by Gd codoping was tested. The overall scintillation efficiency of BaLuYF:Nd1% was comparable to that of the LaF_3:Nd8% reference sample and only slight improvement was observed after Gd1% codoping. The positive effect of Gd codoping was confirmed for higher dopant concentrations. This was explained by an energy transfer from the high-energy Gd^{3+} 4f $^2G(0)_{7/2}$ level to the Nd^{3+} 5d state. On the other hand, pulse-height spectra showed degradation of the light yield under alpha-ray excitation, which was explained by introduction of slow components due to Gd codoping. On the other hand, no positive effect of Gd codoping was found for the overall scintillation efficiency of Nd-doped LuF_3, despite the same energy transfer process was confirmed. Slight improvement of the light yield under alpha-ray excitation was confirmed.

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Assignment of Yb^{3+} energy levels in the C_2 and C_{3i} centers of Lu_2O_3 sesquioxide either as ceramics or as crystal

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Abstract:
Absorption spectroscopy at 4 K, site selective spectroscopy technique at 77 K, decays associated to the applications of barycentre plot law (Antic-Fidancev) and crystal-field strength concept (Auzel and Malta) are used to attempt the assignment of Yb^{3+} energy levels in C_{3i} and C_2 centers of Lu_2O_3 sesquioxide structure either in ceramics or in crystal as potential laser materials.

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Crystal growth and scintillation properties of multi-component oxide single crystals: Ce:GGAG and Ce:La-GPS

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Abstract:
Crystal growth by micro-pulling-down, Czochralski, and floating zone methods and scintillation properties of Ce:$Gd_3(Ga,Al)_5O_{12}$ (Ce:GGAG) multi-component oxide garnets, and Ce:$Gd_2Si_2O_7$ (Ce:GPS) or Ce:$(La,Gd)_2Si_2O_7$ (Ce:La-GPS) pyro-silicates are reviewed. GGAG crystals demonstrated practically linear dependences of some of the parameters including lattice constant, emission wavelength, and band gap on Ga content. However, emission intensity, light yield and energy resolution showed maxima for intermediate compositions. GGAG crystals had the highest light yield of 56,000 photon/MeV for Ga content of 2.7 atoms per garnet formula unit. Similarly the light yield and energy resolution of La-GPS showed the highest values of 40,000 photon/MeV and 4.4%@662 keV, respectively, for La-GPS containing 10% of La. Moreover, La-GPS demonstrated stable scintillation performance up to 200 °C.

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OPT EXPRESS 23, 13210, Published: MAY2015

Characterization of the lasing properties of a 5%Yb doped Lu_2SiO_5 crystal along its three principal dielectric axes.

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Abstract:

The laser performance of a 5% Yb doped Lu2SiO5 (Yb:LSO) has been investigated in quasi continuous-wave pumping regime along the three principal dielectric axes of the crystal, to obtain a complete characterization of its laser properties. The comparison among the obtained results for differently polarized lasers, in term of relative slope efficiency and absolute efficiency, allows the exploitability of different orientations of the material in order to be determined to obtain efficient laser sources. The laser slope efficiency and the energy conversion efficiency were similar for emission polarized along the three indicatrix axes, with noticeable maximum values of slope efficiency around 90% for polarization along the Y and Z axes. Tunable laser action has been obtained in the range 990 nm - 1084 nm, with sizeable differences in the shape of the tuning curve for polarization along the X, Y and Z axes. In particular, the tuning for polarization along the Z axis is relatively flat and uniform in the range 1023 nm - 1083 nm.

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Growth and scintillation properties of praseodymium doped $(Lu,Gd)_3(Ga,Al)_5O_{12}$ single crystals

Kei Kamada[a, b,], , Martin Nikl[c], Shunsuke Kurosawa[a, d], Yasuhiro Shoji[b, d], Jan Pejchal[a, c], Yuji Ohashi[d], Yuui Yokota[a], Akira Yoshikawa[a, b, d]

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Abstract:
Pr doped $(Lu,Gd)_3(Ga,Al)_5O_{12}$ single crystals were grown by the micro-pulling down (μ-PD) method. The crystals were greenish and transparent with 3.0 mm in diameter, 10–30 mm in length. Neither visible inclusions nor cracks were observed. Luminescence and scintillation properties were measured. The substitution at the Al^{3+} sites by Ga^{3+} in garnet structure has been studied. The Pr^{3+} 5d–4f emission is observed within 300–380 nm wavelength superposed with 312 nm emission line of Gd^{3+}. Pr0.2%:$Lu_{2.5}Gd_1Ga_3Al_2O_{12}$ shows highest emission intensity. The light yield of Pr0.2%:$Lu_{2.5}Gd_{0.5}Ga_2Al_3O_{12}$ sample with diameter 3 mm×1 mm size was around 8000 ph/MeV. Two-exponential approximations of scintillation decay showed 39.6 ns (30.6%) and 151 ns (69.4%) decay times.

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THE ASTROPHYSICAL JOURNAL 810, 28, Published:SEP2015

An Electron-Tracking Compton Telescope for a Survey of the Deep Universe by MeV gamma-rays

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Abstract:
Photon imaging for MeV gammas has serious difficulties due to huge backgrounds and unclearness in images, which originate from incompleteness in determining the physical parameters of Compton scattering in detection, e.g., lack of the directional information of the recoil electrons. The recent major mission/instrument in the MeV band, *Compton Gamma Ray Observatory*/COMPTEL, which was Compton Camera (CC), detected a mere ~30 persistent sources. It is in stark contrast with the ~2000 sources in the GeV band. Here we report the performance of an Electron-Tracking Compton Camera (ETCC), and prove that it has a good potential to break through this stagnation in MeV gamma-ray astronomy. The ETCC provides all the parameters of Compton-scattering by measuring 3D recoil electron tracks; then the Scatter Plane Deviation (SPD) lost in CCs is recovered. The energy loss rate (*dE/dx*), which CCs cannot measure, is also obtained, and is found to be helpful to reduce the background under conditions similar to those in space. Accordingly, the significance in gamma detection is improved severalfold. On the other hand, SPD is essential to determine the point-spread function (PSF) quantitatively. The SPD resolution is improved close to the theoretical limit for multiple scattering of recoil electrons. With such a well-determined PSF, we demonstrate for the first time that it is possible to provide reliable sensitivity in Compton imaging without utilizing an optimization algorithm. As such, this study highlights the fundamental weak-points of CCs. In contrast we demonstrate the possibility of ETCC reaching the sensitivity below 1×10^{-12} erg cm^{-2} s^{-1} at 1 MeV.

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JOURNAL OF NUCLEAR SCIENCE AND TECHNOLOGY 53, 1067, Published: JUL2016

A prototype of aerial radiation monitoring system using an unmanned helicopter mounting a GAGG scintillator Compton camera

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Abstract:
Due to the accident of Fukushima Daiichi Nuclear Power Plant, some areas were contaminated by released radioisotopes (mainly ^{137}Cs and ^{134}Cs). Effective decontamination is demanded to encourage evacuated people to return. This paper proposes a new survey system using an unmanned helicopter equipped with a Compton camera for localizing radionuclides. As a prototype, 32 $Ce:Gd_3(Al,Ga)_5O_{12}$ (GAGG) crystals were coupled to 16 silicon photomultipliers and 16 avalanched photodiodes as the scatterer and absorber, respectively. A new Dynamic Time-over-Threshold (dToT) method was applied to convert CR-RC shaping signals to digital signals for multi-channel spectra and coincidence acquisition. The system was designed to work in two modes: one is Compton-camera mode (CCM) which obtains the radiation distribution maps through Compton imaging using hovering flights, while the other one is Gamma-camera mode (GCM) which maps the radiation distribution via measured coincidence events using programmed flights. For point source in CCM, an intrinsic efficiency of 1.68% with a combined standard uncertainty of 0.04% and an angular resolution of about 14° (FWHM, full width at half maximum) was achieved. In GCM, a spatial resolution of about 11 cm (FWHM) was obtained when detecting area is 11.2 cm away from the detector, while it was about 28 cm (FWHM) in single detector mode (SDM). Promising results were obtained in field in Fukushima.

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NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH SECTION A 800, 40, Published: NOV2015

New readout and data-acquisition system in an electron-tracking Compton camera for MeV gamma-ray astronomy (SMILE-II)

T. Mizumoto[a], Y. Matsuoka[a], Y. Mizumura[b, a], T. Tanimori[a, b], H. Kubo[a], A. Takada[a], S. Iwaki[a], T. Sawano[a], K. Nakamura[a], S. Komura[a], S. Nakamura[a], T. Kishimoto[a], M. Oda[a], S. Miyamoto[a], T. Takemura[a], J.D. Parker[a], D. Tomono[a], S. Sonoda[a], K. Miuchi[c], S. Kurosawa[d]

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Abstract:
For MeV gamma-ray astronomy, we have developed an electron-tracking Compton camera (ETCC) as a MeV gamma-ray telescope capable of rejecting the radiation background and attaining the high sensitivity of near 1 mCrab in space. Our ETCC comprises a gaseous time-projection chamber (TPC) with a micro pattern gas detector for tracking recoil electrons and a position-sensitive scintillation camera for detecting scattered gamma rays. After the success of a first balloon experiment in 2006 with a small ETCC (using a 10×10×15 cm^3 TPC) for measuring diffuse cosmic and atmospheric sub-MeV gamma rays (Sub-MeV gamma-ray Imaging Loaded-on-balloon Experiment I; SMILE-I), a $(30\ cm)^3$ medium-sized ETCC was developed to measure MeV gamma-ray spectra from celestial sources, such as the Crab Nebula, with single-day balloon flights (SMILE-II). To achieve this goal, a 100-times-larger detection area compared with that of SMILE-I is required without changing the weight or power consumption of the detector system. In addition, the event rate is also expected to dramatically increase during observation. Here, we describe both the concept and the performance of the new data-acquisition system with this $(30\ cm)^3$ ETCC to manage 100 times more data while satisfying the severe restrictions regarding the weight and power consumption imposed by a balloon-borne observation. In particular, to improve the detection efficiency of the fine tracks in the TPC from ~10% to ~100%, we introduce a new data-handling algorithm in the TPC. Therefore, for efficient management of such large amounts of data, we developed a data-acquisition system with parallel data flow.

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http://www.sciencedirect.com/science/article/pii/S0168900215009328

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Crystal Growth of $Ca_3Nb(Ga_{1-x}Al_x)_3Si_2O_{14}$ Piezoelectric Single Crystals with Various Al Concentrations

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Abstract:
Ca3Nb(Ga1-xAlx)3Si2O14 (CNGAS) single crystals with various Al concentrations were grown by a micro-pulling-down (μ-PD) method and their crystal structures, chemical compositions, crystallinities were investigated. CNGAS crystals with x = 0.2, 0.4 and 0.6 indicated a single phase of langasite-type structure without any secondary phases. In contrast, the crystals with x = 0.8 and 1 included some secondary phases in addition to the langasite-type phase. Lattice parameters, a- and c-axes lengths, of the langasite-type phase systematically decreased with an increase of Al concentration. The results of chemical composition analysis revealed that the actual Al concentrations in as-grown crystals were almost consistent with the nominal compositions. In addition, there was no large segregation of each cation along the growth direction.

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https://www.researchgate.net/publication/281616343_Crystal_Growth_of_Ca3NbGa1-xAlx3Si2O14_Piezoelectric_Single_Crystals_with_Various_Al_Concentrations

OPTICAL MATERIALS 50, 71, Published:DEC2015

Directionally solidified Eu doped CaF_2/Li_3AlF_6 eutectic scintillator for neutron detection

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Abstract:

Eu doped CaF_2/Li_3AlF_6 eutectics were grown by μ-PD method. The directionally solidified eutectic with well-aligned 600 nm diameter Eu:CaF_2 scintillator fibers surrounded with Li_3AlF_6 was prepared. The grown eutectics showed an emission peak at 422 nm ascribed to Eu^{2+} 4f–5d transition from Eu:CaF_2 scintillation fiber. Li concentration in the Eu:CaF_2–Li_3AlF_6 eutectic is around 0.038 mol/cm^3,which is two times higher than that of $LiCaAlF_6$ single crystal (0.016 mol/cm^3). The light yield of Eu:CaF_2–Li_3AlF_6 eutectic was around 7000 ph/neutron. The decay time was about 550 ns (89%) and 1450 ns (11%).

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Growth and piezoelectric properties of $Ca_3Nb(Ga_{1-x}Al_x)_3Si_2O_{14}$ (x = 0.25 and 0.50) single crystals

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Abstract:

One inch Ca3NbGa3Si2O14 (CNGS) and Ca3Nb(Ga1-xAlx)3Si2O14 (CNGAS) bulk crystals with an ordered langasite-type structure were grown by a Czochralski method. CNGS bulk single crystals without cracks could be grown, while CNGAS bulk crystals with x = 0.25 and 0.50 included some cracks even under improved growth conditions. Lattice parameters and anisotropy on the structure of grown crystals were systematically decreased and increased by increasing the Al concentration, respectively. Although the density and dielectric constant ε11 of an X-cut sample of the CNGAS crystal with x = 0.25 were decreased by Al substitution, the electromechanical coupling factor k12 and piezoelectric constant d11 were increased. The effects of Al substitution on piezoelectric properties were almost consistent with previous reports on the disordered langasite-type crystals except for their amount of change.

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NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH SECTION A 806, 395, Published: JAN2016

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment

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Abstract:

BiI_3 single crystals were grown by the physical vapor transport method. The repeated sublimation of the starting material reduced impurities in the BiI_3 single crystal to sub-ppm levels. The detector was fabricated by depositing Au electrodes on both surfaces of the 100-μm-thick BiI_3 single crystal platelet. The resistivity of the BiI_3 single crystal was increased by post-annealing in an iodine atmosphere (ρ=1.6×10^{11} Ω cm). Pulse height spectroscopy measurements showed clear peaks in the energy spectrum of alpha particles or gamma rays. It was estimated that the mobility-lifetime product was $\mu_e\tau_e$=3.4–8.5×10^{-6} cm^2/V and the electron–hole pair creation energy was 5.8 eV. Our results show that BiI_3 single crystals are promising candidates for detectors used in radiographic imaging or gamma ray spectroscopy.

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Recent R&D Trends in Inorganic Single-Crystal Scintillator Materials for Radiation Detection

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Abstract:

In this review, the major achievements and research and development (R&D) trends from the last decade in the field of single crystal scintillator materials are described. Two material families are included, namely, those of halide and oxide compounds. In most cases, the host crystals are doped with Ce^{3+}, Pr^{3+} or Eu^{2+} rare earth ions. Their spin- and parity-allowed 5d–4f transitions enable a rapid scintillation response, on the order of tens to hundreds of nanoseconds. Technological recipes, extended characterization by means of optical and magnetic spectroscopies, and theoretical studies are described. The latter provide further support to experimental results and provide a better understanding of the host electronic band structure, energy levels of specific defects, and the emission centers themselves. Applications in medical imaging and dosimetry, security measures, high-energy physics and the high-tech industry, in which X(γ)-rays or particle beams are used and monitored, are recognized as the main driving factor for R&D activities in this field.

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Growth of 1.5-In Eu : Single Crystal and Scintillation Properties

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Abstract:

We grew 1.5-in Eu doped SrI2 (Eu:SrI2) bulk single crystal by a modified vertical Bridgman (VB) method using a removable chamber and high-frequency induction heating. As-grown 1.5-in Eu:SrI2 bulk single crystal had no visible crack and inclusion in the crystal. In the transmittance and α-ray radioluminescence spectra, large absorption below 433 nm and emission peak at 433 nm were observed, respectively. Each polished Eu:SrI2 specimen indicated 56 000 ~ 62 000 ph/MeV light yield and 3.3 ~ 3.9% energy resolution. The decay times of the specimens were 0.61 ~ 0.67 μs.

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ELECTRONICS LETTERS 51, 1957, Published: NOV2015

Acoustical physical constants around room temperature for $Ca_3TaGa_{1.5}Al_{1.5}Si_2O_{14}$ single crystal

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Abstract:
A full set of acoustical physical constants was determined for Ca3TaGa1.5Al1.5Si2O14(CTGAS) single crystal from ulk wave velocities measured by the ultrasonic micro-spectroscopy method. Several plate specimens were cut perpendicular to theX-Y-,Z-,35.25°Y-, and 139.74°Y-directions from a CTGAS single crystal ingot grown by Czochralski technique. Following measurements of dielectric constants and density, elastic constants, piezoelectric constants, and their temperature coefficients were determined from longitudinal wave and shear wave velocities measured for the CTGAS specimens at around room temperature. It was demonstrated that the as found constants could provide calculation accuracy within ±0.15% in leaky surface acoustic wave velocity. The determined constants were used for numerical calculation of the cut angle, at which the temperature coefficient of shear wave velocity becomes zero. This angle corresponded to 147.9°Y-cut substrate that had electromechanical coupling factor fk2= 3.2%. This parameter is about four times greater than that of AT-cutαquartz

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Energy resolution studies of Ce- and Pr-doped aluminum and multicomponent garnets: The escape and photo-peaks

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Abstract:
The photopeak and escape peak processes were studied in heavy Ce^{3+}-doped LuAG and GGAG, Pr^{3+}-doped LuAG and undoped BGO scintillating crystals. Energy resolution measurements were performed with 511 keV photons of ^{22}Na radioisotope. In the pulse-height spectra the escape peaks were resolved clearly on thin samples (up to 3 mm). If sample thickness increases the escape peak cannot be resolved anymore (for thicknesses approx. above 5 mm, especially). Consequently, energy resolution increases by about 40% compared with that measured at 1 mm thick samples.

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JOURNAL OFLUMINESCENCE 169, 539, Published: JAN2016

The role of cerium variable charge state in the luminescence and scintillation mechanism in complex oxide scintillators: The effect of air annealing

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Abstract:
The influence of annealing in air at elevated temperatures on the absorption, luminescence and scintillation characteristics was studied for a set of Ce-doped aluminum garnet and perovskite single crystals. Positive effects consisting mainly in increase of light yield and decrease of afterglow were found to varying extent in all the materials. It is explained by the positive role of created stable Ce^{4+} center in scintillation mechanism and by decrease of deep trap concentration based on oxygen vacancies.

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Energy migration processes in undoped and Ce-doped multicomponent garnet single crystal scintillators

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Abstract:

Multicomponent garnets ($Y_{3-x}Gd_xAl_{5-y}Ga_yO_{12}$) doped with Ce^{3+} ions are promising scintillators with a high density, fast response time and high light yield. To deepen the knowledge about the transfer stage of scintillation mechanism we discuss the energy migration and energy transfer processes in the set of undoped and Ce^{3+} activated multicomponent garnet single crystals. Temperature dependence of Gd^{3+} emission intensities as well as decay kinetics in $Y_{3-x}Gd_xAl_{5-y}Ga_yO_{12}$ (x,y=1,2,3) crystals point to the $Gd^{3+}\rightarrow Gd^{3+}$ nonradiative energy migration, which is diffusion limited. Concentration quenching of Gd^{3+} emission occurs by energy migration to accidental impurities and/or structure defects. Temperature dependence of photoluminescence emission intensities and decay time measurements of Gd^{3+} as well as Ce^{3+} ions in $Gd_3Ga_3Al_2O_{12}$:Ce^{3+} single crystal reveal nonradiative energy transfer $Gd^{3+}\rightarrow Ce^{3+}$ (including migration through Gd^{3+} sublattice) which is responsible for slow Ce^{3+} fluorescence decay component.

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Optical and scintillation properties of Ce^{3+}-doped $YGd_2Al_{5-x}Ga_xO_{12}$ (x=2,3,4) single crystal scintillators

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Abstract:

The optical and scintillation properties of Ce^{3+}-doped $YGd_2Al_{5-x}Ga_xO_{12}$ (x=2,3,4) single crystals were investigated. With increasing Ga content in the garnet host, the $5d_1$ absorption and emission bands shift toward higher energy due to the decrease in the crystal field splitting of the 5d levels. Temperature dependences of absorption and emission spectra and of photoluminescence decays of both prompt and delayed components were measured. Light yield (LY) and its dependence on an amplifier shaping time were measured under excitation with γ-rays. High LY value of 38,000 photons/MeV was obtained for a $YGd_2Al_2Ga_3O_{12}$:Ce sample. Scintillation decay was measured with an extended dynamical and temporal scale under the nanosecond-pulsed soft X-ray excitation. The relative content of the fastest component in the scintillation response increases with increasing Ga content.

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JOURNAL OF CRYSTAL GROWTH 452, 95, Published: OCT2016

Luminescent properties of Cr-doped gallium garnet crystals grown by the micro-pulling-down method

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Abstract:
Cr-doped $(Gd_xY_{1-x})_3Ga_5O_{12}$ crystals (x=0.00, 0.25, 0.50, 0.75 and 1.00) were grown by the micro-pulling-down method and examined for their possible application as red and infrared scintillating detectors in medical field. Although Cr:$(Gd_{0.75}Y_{0.25})_3Ga_5O_{12}$ and Cr:$Gd_3Ga_5O_{12}$ had similar X-ray diffraction patterns, other samples showed some change in lattice constant. All the crystals had broad emission bands in the red and infrared region when excited by either 450 nm photons or X rays. These bands were associated with $^4T_2 \rightarrow A_2$ transitions. Moreover, redshift of the emission-peak wavelengths ($^4T_2 \rightarrow {}^4A_2$) and absorption peaks ($^4A_2 \rightarrow {}^4T_1$ and $^4T_2$) was observed with increase of Gd content (x) in Cr-doped $(Gd_xY_{1-x})_3Ga_5O_{12}$ due to the change of the crystal fields. The crystals had scintillation emissions in the wavelength region suitable for the real time dose monitoring in radiation therapy.

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OPTICAL MATERIALS 41, 80, Published: MAR2015

Luminescence study on Eu or Tb doped lanthanum–gadolinium pyrosilicate crystal

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Abstract:
$(Eu_{0.01}, Gd_{0.90}, La_{0.09})_2Si_2O_7$ (Eu:La–GPS) and $(Tb_{0.01}, Gd_{0.90}, La_{0.09})_2Si_2O_7$ (Tb:La–GPS) crystals were grown by the floating zone method, and their optical and scintillation properties were investigated. Gd^{3+}-to-Tb^{3+} or –Eu^{3+} energy transfer processes were found, and photo-luminescence and radio-luminescence emission spectra showed $^5D_0$–^7F_i (i = 1–4) Eu^{3+} transitions in Eu:La–GPS, and $^5D_3$–^7F_i (i = 3–6) and $^5D_4$–^7F_i (i = 3–6) transitions in Tb:La–GPS. Using these scintillators, alpha-ray imaging was possible with a CMOS camera. These materials can be used for X-ray detection as well.

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OPTICAL MATERIALS 47, 462, Published: SEP2015

Significant blue-shift in photoluminescence excitation spectra of Nd^{3+}:LaF_3 potential laser medium at low-temperature

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Abstract:

Temperature-dependent optical properties of bulk Nd^{3+}:LaF_3 crystals are reported. A blue-shift in the photoluminescence excitation (PLE) spectrum is observed at 30 K. The 173.2-nm emission peak wavelength at 300 K shifted to 172.8 nm at 30 K, consistent with the 6-nm blue-shift in transmission edge and 2437-cm^{-1} increase in the lowest energy level of the $4f^2 5d$ configuration. Thermal broadening of the 5d–4f emission bands with increasing temperature is also observed as the dip at around 178.5 nm present at 30 K disappears at 300 K. A smaller spectral overlap between the PLE and emission spectra is observed as temperature is decreased. Our results suggest that absorption cross-section at the peak fluorescence wavelength is expected to decrease at 30 K.

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Growth and scintillation properties of Eu doped $BaCl_2$/LiF eutectic scintillator

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Abstract:

Eu doped $BaCl_2$/LiF eutectics were grown by the micro-pulling down method and their directionally solidified eutectic (DSE) system has been investigated. The grown eutectic showed main phases of cubic LiF and orthorhombic $BaCl_2$. In these eutectics, the 399 nm emission of Eu^{2+} 4f5d was obtained. It shows the intrinsic decay time of about 410 ns. The light yield of the 1-mm-thick eutectic showed 7000 ph/5.5 MeV alpha-ray.

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Luminescence mechanism in doubly Gd, Nd-codoped fluoride crystals for VUV scintillators

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Abstract:
The Nd-doped, Gd-doped and doubly Nd, Gd-codoped $BaLu_{1.2}Y_{0.8}F_8$ (BaLuYF) and LuF_3 single crystals were grown by a micro-pulling-down method. Their photoluminescence, radioluminescence and alpha-ray-excited pulse-height spectra were studied in the vacuum-ultra-violet (VUV) region to confirm their possible application as fast VUV scintillators. Complementary photoluminescence measurements in the ultra-violet/visible spectral region were performed as well. The possibility of scintillation performance improvement by Gd codoping was tested. The overall scintillation efficiency of BaLuYF:Nd1% was comparable to that of the LaF_3:Nd8% reference sample and only slight improvement was observed after Gd1% codoping. The positive effect of Gd codoping was confirmed for higher dopant concentrations. This was explained by an energy transfer from the high-energy Gd^{3+} 4f $^2G(0)_{7/2}$ level to the Nd^{3+} 5d state. On the other hand, pulse-height spectra showed degradation of the light yield under alpha-ray excitation, which was explained by introduction of slow components due to Gd codoping. On the other hand, no positive effect of Gd codoping was found for the overall scintillation efficiency of Nd-doped LuF_3, despite the same energy transfer process was confirmed. Slight improvement of the light yield under alpha-ray excitation was confirmed.

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Timing characteristics of the scintillation response of $Gd_3Al_2Ga_3O_{12}$:Ce and $Gd_3Al_{2.6}Ga_{2.4}O_{12}$:Ce single crystal scintillators

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Abstract:

The timing characteristics of scintillation response of Czochralski-grown $Gd_3Al_2Ga_3O_{12}$:Ce and $Gd_3Al_{2.6}Ga_{2.4}O_{12}$:Ce single crystals were compared. The photoelectron yield, scintillation decay times, and coincidence time resolution were measured. At 662 keV γ-rays, the photoelectron yield of 6200 phe MeV^{-1} obtained for $Gd_3Al_2Ga_3O_{12}$:Ce is higher than that of 4970 phe MeV^{-1} obtained for $Gd_3Al_{2.6}Ga_{2.4}O_{12}$:Ce, while an inferior energy resolution of the former (7.2% vs. 5.6%) is observed. Scintillation decays are approximated by sum of exponentials with the dominant fast component decay time and its relative intensity of 89 ns (73%) for $Gd_3Al_2Ga_3O_{12}$:Ce and 136 ns (69%) for $Gd_3Al_{2.6}Ga_{2.4}O_{12}$:Ce. The coincidence time resolution obtained for $Gd_3Al_2Ga_3O_{12}$:Ce is superior than that of $Gd_3Al_{2.6}Ga_{2.4}O_{12}$:Ce. The normalized time resolution was also discussed in terms of a number of photoelectrons and decay characteristics of the light pulse.

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Scintillation properties of Zr co-doped Ce:$(Gd, La)_2Si_2O_7$ grown by the Czochralski process

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Abstract:

$(Gd_{0.75},Ce_{0.015},La_{0.235})_2Si_2O_7$ (Ce:La-GPS) single crystals co-doped with 0, 100, 200, 500 and 1000 ppm Zr were grown by the Czochralski process, and their scintillation properties were investigated. We investigated the co-doping effect of a stable tetravalent ion in Ce:La-GPS for the first time. The scintillation decay times in the faster component were shortened with increasing the Zr concentration. While the non-co-doped sample showed ~63 ns day time, the Zr 100, 200, 500 and 1000 ppm co-doped samples showed ~61, ~59, ~57, ~54 ns, respectively. Additionally, light output, photon nonproportional response (PNR) and other optical properties were investigated.

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Improvement of the growth of Li_4SiO_4 single crystals for neutron detection and their scintillation and luminescence properties

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Abstract:

We have investigated Li_4SiO_4 scintillation crystals for their possible application in neutron detection due to high Li content and low density of 2.35 g/cm^3. The micro-pulling-down method employing the Ir crucible and afterheater was optimized for crystal growth of Li_4SiO_4 taking into account the Li evaporation. To grow high-quality crack-free single crystals, the heating power was increased to establish milder temperature gradient, thicker meniscus, smaller crystal diameter and resulting smaller stress in the as-grown crystals. The undoped, Ti-, Cr-, and Al- doped crystals were prepared and studied. Radioluminescence measurements under X-ray excitation showed quite high overall scintillation efficiency of the Ti-doped sample reaching as high as 250% of that of $Bi_4Ge_3O_{12}$ reference scintillator. The emission spectrum was dominated by one broad band peaking at 350 nm related to Ti^{4+} impurity. Reasonable light yield of 10000 photons/neutron was found. However, its long decay time of 54 μs might be a limitation especially for high counting rate applications. The overall scintillation efficiency of the Cr^{3+} sample was much lower and the spectrum shows one broad peak at 463 nm which does not correspond to Cr^{3+} luminescence. The radioluminescence spectrum of the Al-doped sample resembled to that of the Ti-doped one, just its magnitude is considerably lower, which was explained by Ti contamination. Peculiarities and optimization of crystal growth and a preliminary sketch of luminescence mechanisms and dopant incorporation are discussed.

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RADIATION MEASUREMENTS 90, 287, Published: JUL2016

Luminescence properties of the Mg co–doped Ce:$SrHfO_3$ ceramics prepared by the Spark Plasma Sintering Method

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Abstract:
1300 or 1400 °C pre–sintered Al/Ce/Mg:$SrHfO_3$ and Al/Ce:$SrHfO_3$ ceramics were prepared by the Spark Plasma Sintering (SPS) in order to search for a new scintillation material with a high–effective atomic number(Z_{eff}) and good light output. The $SrHfO_3$ has a high Z_{eff} of 60, and high gamma–ray detection efficiency is expected. Meanwhile it has a high melting point of over 2500 °C, and single crystal is hard to be grown. On the other hand, high melting materials can be prepared as ceramics, and the SPS method is a simple process to fabricate the ceramics within a few hours. Thus, we prepared the samples using the SPS method, and their optical and scintillation properties were investigated. We found that Al/Ce/Mg:$SrHfO_3$ and Al/Ce:$SrHfO_3$ ceramics had an emission wavelength at around 400 nm originating from 5d–4f transition of Ce^{3+}. Moreover, Al/Ce/Mg:$SrHfO_3$ pre-sintered at a temperature of 1400 °C had a light output of approximately 5,000 ph/MeV. In this paper, the light output of Mg-co-doped samples was improved compared with the Mg-free ones. The light output also depends on the pre-sintering temperature.

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Growth and radioluminescence of metal elements doped $LiCaAlF_6$ single crystals for neutron scintillator

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Abstract:
The ns^2-type metal elements (Pb and Sn) doped $LiCaAlF_6$ single crystals were grown by a micro-pulling-down (μ-PD) method. Pb doped $LiCaAlF_6$ [Pb:LiCAF] crystals showed high transparency and single phase of the LiCAF structure. However, we could not obtain Sn:LiCAF crystals due to the evaporation of SnF_2 during the crystal growth. There was an absorption peak around 193 nm in the transmittance spectrum of Pb:LiCAF crystal. In the radioluminescence spectrum of the Pb:LiCAF crystal under X-ray irradiation, two emission peaks around 200 and 830 nm were observed.

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RADIATION MEASUREMENTS, 90, 153, Published: JUL2016

Luminescence and scintillation response of $YGd_2Al_2Ga_3O_{12}$:Ce and $LuGd_2Al_2Ga_3O_{12}$:Ce scintillators

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Abstract:
The luminescence and scintillation properties of $YGd_2Al_2Ga_3O_{12}$:Ce and $LuGd_2Al_2Ga_3O_{12}$:Ce single crystal scintillators were compared. The light yield (LY) and energy resolution were measured using R6231 photomultiplier. At 662 keV γ-rays, high LY value of 37,900 ph/MeV and energy resolution of 7.0% obtained for $YGd_2Al_2Ga_3O_{12}$:Ce are slightly better than the values of 35,400 ph/MeV and 7.6% obtained for $LuGd_2Al_2Ga_3O_{12}$:Ce. The ratio of LY values under excitation with α- and γ-rays (α/γ ratio) was also determined. The LY dependence on amplifier shaping time was measured in order to investigate the timing characteristics in the scintillation response. The estimated photofraction in pulse height spectrum of 662 keV γ-rays and the total mass attenuation coefficient at 662 keV γ-rays were also determined and compared with the theoretical ones calculated using the WinXCom program.

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Czochralski Growth of 2 Inch $Ca_3Ta(Ga,Al)_3Si_2O_{14}$ Single Crystals for Piezoelectric Applications

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Abstract:
Growth of 2-in. diameter Al-substituted $Ca_3TaGa_3Si_2O_{14}$ crystals by Czochralski method is reported. The crystals were grown from the melt of $Ca_3TaGa_{1.5}Al_{1.5}Si_2O_{14}$ composition and had langasite structure. No inclusions of secondary phases were detected in these crystals. The $Ca_3Ta(Ga,Al)_3Si_2O_{14}$ mixed crystals produced using non-substituted $Ca_3TaGa_3Si_2O_{14}$ seeds were defective. They had cracks and/or poly-crystalline structure. However, those grown on the seed of approximately $Ca_3TaGa_{1.5}Al_{1.5}Si_2O_{14}$ composition were defect-free. Phase diagram of the $Ca_3TaGa_3Si_2O_{14}$–$Ca_3TaAl_3Si_2O_{14}$ pseudo-binary system and segregation phenomenon are discussed in some details. Homogeneity of the crystals was evaluated by measuring 2D-mapping of leaky surface acoustic wave (LSAW) velocities for *Y*-cut $Ca_3TaGa_{1.5}Al_{1.5}Si_2O_{14}$ substrate. Although some inhomogeneities were observed due to slight variations in chemical composition, the crystal had acceptable homogeneity for applications in acoustic wave devices exhibiting the LSAW velocity variation within ±0.048%

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Effects of Na and K co-doping on growth and scintillation properties of Eu:SrI_2 crystals

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Abstract:
We grew Na and K co-doped Eu:SrI_2 [Na,Eu:SrI_2 and K,Eu:SrI_2] crystals by a modified micro-pulling-down method to reveal the co-doping effects on the crystal growth and scintillation properties. The non-codoped, Na0.5%, Na1.0%, K0.5% and K1.0%,Eu:SrI_2 crystals indicated high transparency while the milky parts were generated in the Na5.0% and K5.0%,Eu:SrI_2 crystals. The light yields of Na,Eu:SrI_2 and K,Eu:SrI_2 crystals under γ-ray irradiation were decreased by the Na and K co-doping. On the other hand, there was a small change within 940–1020 ns in the decay times by the Na and K co-doping. In the light yield proportionality under γ-ray irradiation, the non-proportionality in the low energy region was improved by Na and K co-doping.

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Optical and scintillation properties of $Sr_3BGa_3Si_2O_{14}$ (B = Nb, Ta) single crystals

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Abstract:
Optical and scintillation properties of $Sr_3NbGa_3Si_2O_{14}$ [SNGS] and $Sr_3TaGa_3Si_2O_{14}$ [STGS] single crystals with the langasite-type crystal structure were investigated as a novel scintillator materials. In the transmittance spectra of the SNGS and STGS polished specimens, absorption peaks around 380 and 505 nm were observed and the absorptions are considered to be attributable to the excess oxygen in the crystals. An emission peak around 420 nm was observed in the X-ray radioluminescence spectrum of the SNGS crystal. On the other hand, there was an emission peak around 335 nm in the X-ray radioluminescence spectrum of the STGS crystal.

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IEEE TRANSACTIONS ON NUCLEAR SCIENCES 63, 443, Published: APR2016

Large Size Czochralski Growth and Scintillation Properties of Mg^{2+} Co-doped Ce:$Gd_3Ga_3Al_2O_{12}$

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Abstract:
The 3 inch size Mg co-doped Ce : $Gd_3Al_2Ga_3O_{12}$ single crystals were prepared by the Czochralski (Cz) method. Absorption and luminescence spectra were measured together with several other scintillation characteristics, namely the scintillation decay and light yield to reveal the effect of Mg co-doping. The timing resolution measurement for a pair of 3 × 3 × 3 mm^3 size GAGG:Ce.Mg scintillator crystals was performed using Si-PMs.

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Single Crystal Growth of Cerium and Praseodymium Doped $YCa_4O(BO_3)_3$ Scintillator by Micro-Pulling Down Method

Kei Kamada[1], Shunsuke Kurosawa[1], Yuui Yokota[1], Jan Pejchal[2], Yuji Ohashi[3], Masao Yoshino[3], and Akira Yoshikawa[1,3]

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Abstract:
Ce and Pr doped YCOB single crystals were grown by the micro-pulling down (μ−PD) method and characterized as for the structure and chemical composition. The expected 420 nm emission of Ce^{3+} 4f-5d has been observed in Ce:YCOB. Pr:YCOB shows broad emission spectrum peaking around 350 nm and this emission can be well ascribed to the 5d–4f emission of Pr^{3+} Luminescence and scintillation characteristics of these crystals
were also investigated

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LASER PHYSICS LETTERS, 13, 035402, Published: FEB2016

Random laser action in stoichiometric $Nd_3Ga_5O_{12}$ garnet crystal powder

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Abstract:
This work explores the room temperature infrared random laser (RL) performance of Nd^{3+} ions in a new stoichiometric $Nd_3Ga_5O_{12}$ crystal powder. The time-resolved measurements show that the RL pulse is able to follow the subnanosecond oscillations of the pump pulse profile. The pump threshold energy and the absolute stimulated emission energy have been measured using a method developed by the authors. The laser slope efficiency is the highest compared to other Nd^{3+} stoichiometric RL crystals.

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JAPANESE JOURNAL OF APPLIED PHYSICS 54, O4DH17-1, Published: MAR2015

Improvement of scintillation properties on Ce doped $Y_3Al_5O_{12}$ scintillator by divalent cations co-doping

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Abstract:
The Mg co-doped $Y_3Al_5O_{12}$:Ce single crystal scintillators were prepared by micro pulling down method in a wide concentration range 0–3000 ppm of Mg co-dopant. Absorption and luminescence spectra were measured together with several other scintillation characteristics, namely the scintillation decay, light yield to reveal the effect of Mg co-doping. The scintillation decays were accelerated by Mg co-doping. The Mg co-doped samples showed much faster decay with increasing Mg.

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The Stable Ce^{4+} Center: A New Tool to Optimize Ce-Doped Oxide Scintillators

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e Laser Laboratorium Göttingen e. V., Göttingen, Germany

Abstract:
The role and effect of stable Ce^{4+} centers in Ce-doped LuAG single crystal scintillator is further studied by means of measurements of several optical, luminescence and scintillation characteristics. Two LuAG:Ce single crystal samples are compared: in one of them the dominating Ce^{4+} center is stabilized by high concentration Mg^{2+} codoping while the other one shows only the presence of stable Ce^{3+} center. Tailored (Eu, Mg)-doped LuAG single crystal is also prepared to test the presence and thermal stability of hole traps in the host which affect the timing characteristics of Ce^{4+} scintillation cycle, namely its restoration back to 4+ charge state in last step of the cycle. EPR experiment was also employed at Mg- and (Eu, Mg) doped LuAG samples and the signature of the O^- hole center stabilized by Mg^{2+} ion was clearly obtained.

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IEEE TRANSACTIONS ON NUCLEAR SCIENCE 63, 453, Published: MAR2016

Growth and Luminescence Properties of Eu:SrI_2 Single Crystals Prepared by Modified Micro-Pulling-Down Method

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c New Industry Creation Hatchery Center (NICHe), Tohoku University, Sendai, Japan

Abstract:
This paper reports on the preparation and growth of Eu-doped strontium iodide (SrI_2) single crystals by modified micro-pulling-down method. Influence of the Eu^{2+} and Eu^{3+} (introduced in form of EuI_2 and $EuCl_3$) on the luminescence and scintillation properties is analyzed. Sufficient optical quality of prepared single crystals was obtained allowing further characterization of their absorption, radio- and photoluminescence spectra. Photoluminescence and scintillation decay time of grown SrI_2 crystals irradiated under γ-ray source were evaluated as well.

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OPTICAL MATERIALS 58, 5, Published: AUG2016

Temperature-dependent evaluation of Nd:LiCAF optical properties as potential vacuum ultraviolet laser material

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Abstract:
We investigate the temperature-dependent optical properties of Nd^{3+}-doped $LiCaAlF_6$ (Nd:LiCAF) in the vacuum ultraviolet (VUV) region. The 172-nm absorption edge does not seem to experience any significant blue shift as temperature is decreased from room temperature down to 30 K. This is confirmed by excitation spectra for the same temperature range. Several energy levels in the excited state configuration are observed. Based on these energy levels, the dominant emission peak at 177 nm is assigned to the allowed dipole transition from the $4f^25d$ configuration of Nd^{3+} and the $^4I_{11/2}$ level of the $4f^3$ ground state configuration. The position of the dominant 177-nm emission peak appears to be fixed across the temperature range considered. Our results suggest that the spectral overlap between the excitation and emission spectra should not increase as temperature is raised, possibly making Nd:LiCAF a potential VUV laser gain medium operating at room temperature.

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http://www.sciencedirect.com/science/article/pii/S092534671630235X

Proceedings of the 29th Workshop on Radiation Detectors and Their Uses, Published: DEC2015

Scintillation Properties Of Mg Co-doped Ce:(Gd, La)2Si2O7 Grown By Czochralski Method

Rikito Murakami[1], Shunsuke Kurosawa[1,2], Yasuhiro Shoji[1,3], Yuui Yokota[2], Jan Pejchal[2,4], Yuji Ohashi[1], Kei Kamada[2,3] and Akira Yoshikawa[1,2,3]

1 Institute for Material Research, Tohoku University, Sendai 980-8577, Japan
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3 C&A Corporation, Sendai 980-8579, Japan
4 Institute of Physics AS CR, 16253 Prague, Czech Republic

Site Address:
https://lib-extopc.kek.jp/preprints/PDF/2015/1525/1525008.pdf

2015（平成27年）2月14日（土）
日本経済新聞

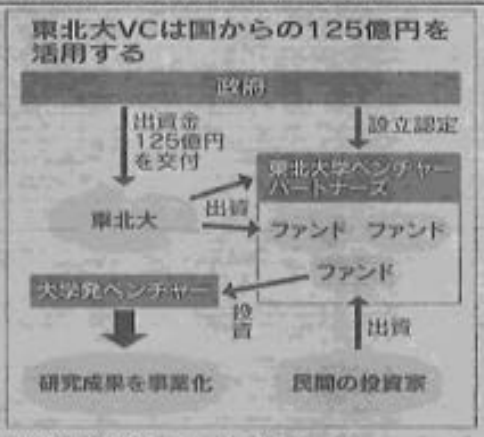
2015年（平成27年）2月14日（土曜日）

東北大、大学発VBに投資

復興に向け、月内に新会社

材料分野など事業化

東北大学は2月中にもベンチャーキャピタル（VC）を設立する。国が交付する125億円を東北大学発のベンチャー企業に投資して、世界でも有数の技術を持つ材料分野などで研究成果の事業化につなげる。東日本大震災の被災地では地場産業の復活が遅れており、有望なベンチャー企業を育成することで産業振興を加速する考えだ。




社長に就任する八浪哲二氏

2月中にも国からVCへの出資認可を得る見通し。東北大は認可後ただちにVCを設立する。社名は「東北大学ベンチャーパートナーズ」。資本金は1億円前後で、東北大が全額出資する。本社は仙台市の青葉キャンパス内に置く。

社長には化学メーカーのダイセル副社長で、東北大OBの八浪哲二氏を招く。取締役は八浪氏を含め4人。ゴールドマン・サックス・アセット・マネジメント元社長の土岐敦介・東北大学総長特別補佐らが就く。

年度内にも第1号のファンドを組成する。国が交付する資金に加え、金融機関などから出資を募る計画。将来的には複数のファンドを組成する。投資先は学内の研究成果や東北大が関わる共同研究などを活用するベンチャーに限定する。

VCはベンチャーへの投資を決める機関として、八浪社長らで構成する「支援・投資委員会」を設ける。委員会メンバーの過半数は事業化の経験者を社外から招き、投資を審査する。学内の研究者などがベンチャーを興すときや設立後に投資する。今後数年間で10社以上に投資し、世界展開できる会社を2社は育てたいという。

東北大は材料分野などで世界屈指の技術を持つ。米調査会社トムソン・ロイターの論文引用回数に基づく研究機関ランキングによると、材料科学分野は2013年に世界6位だった。VCは材料科学など東北大が伝統的に強みを持つ分野を中心に投資していく考えだ。

政府は成長戦略の一環として、国立大が国の資金を使って大学発ベンチャーに出資できるようにした。国立大が出資するVCは京都大学と大阪大学に続き3例目となる。

大学の研究成果は基礎的なものが多く、事業化に時間がかかるケースが多い。投資会社が資金を回収するのにも時間がかかるため、大学発ベンチャーは民間VCからの資金集めが難しかった。

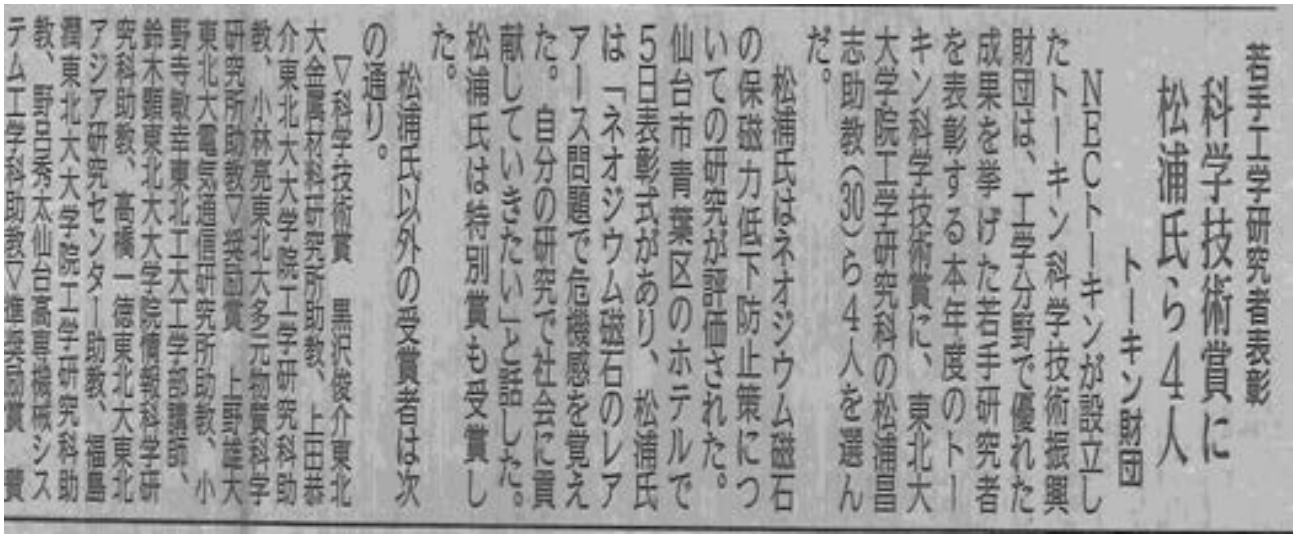
起業人材育成へ土壌づくりを

東北大学が自前のベンチャーキャピタル（VC）を設立する背景には、大学発ベンチャー育成の難しさがある。既存の民間VCは事業基盤がある程度固まった新興企業に投資することが多い。今回のVCは大学の研究成果を種に事業を興すベンチャーが投資対象だ。民間VCが扱いにくい分野を補完する格好になる。

ただ地方でVCの事業は難しい。仙台市や地元経済界の後押しを受け2003年に創業した東北イノベーションキャピタル（同市）でも、これまでに上場を果たした投資先は3社どまり。初期段階の企業に投資するため東北大のVCの場合、成果を上げるにはさらに時間がかかる可能性がある。

地方で有力なベンチャーが現れにくい要因の一つに、上場を目指す機運のそしさがある。東北大は今回のVCの事業目的に「東北発のグローバル起業人材の輩出」を掲げている。起業を目指す若者らの層が厚くなるよう、東北大には地域の意識を変える先導の役割を望みたい。

2015（平成27年）3月7日（土）
河北新報



若手工学研究者表彰

科学技術賞に松浦氏ら4人

トーキン財団

NECトーキン科学技術振興財団は、工学分野で優れた成果を挙げた若手研究者を表彰する本年度のトーキン科学技術賞に、東北大大学院工学研究科の松浦昌志助教（30）ら4人を選んだ。

松浦氏はネオジウム磁石の保磁力低下防止策についての研究が評価された。仙台市青葉区のホテルで5日表彰式があり、松浦氏は「ネオジウム磁石のレアアース問題で危機感を覚えた。自分の研究で社会に貢献していきたい」と話した。松浦氏は特別賞も受賞した。

松浦氏以外の受賞者は次の通り。

▽科学技術賞　黒沢俊介東北大金属材料研究所助教、上田恭介東北大大学院工学研究科助教、小林亮東北大多元物質科学研究所助教▽奨励賞　上野祥大東北大電気通信研究所助教、小野寺敏幸東北工大工学部講師、鈴木顕東北大大学院情報科学研究科助教、高橋一徳東北大東北アジア研究センター助教、福島潤東北大大学院工学研究科助教、野呂秀太仙台高専機械システム工学科助教▽準奨励賞　費

2015（平成27年）5月22日（金）
河北新報

若手研究者 11人奨励賞
インコス財団

東北活性化への貢献が期待される自然科学分野の若手研究者を表彰する「インテリジェント・コスモス奨励賞」の授与式が18日、仙台市青葉区のホテルであり、受賞の11人に記念の盾と研究費20万円が贈られた。

主催するインテリジェント・コスモス学術振興財団の西澤潤一理事長は「今後もオリジナリティーあふれる研究を続けてほしい」と激励。受賞者を代表し、半導体原子層物質の研究に取り組む加藤俊顕東北大大学院工学研究科講師が「受賞を励みに研究を進め、社会に成果を還元できるよう努力したい」と述べた。

奨励賞には青森、宮城、山形、福島、新潟の5県から33件の応募があった。他の受賞者は次の通り。

黒沢俊介東北大金属材料研究所助教▽高橋晶子仙台高専専攻科准教授▽韋冬長岡技術科学大工学部機械系助教▽浜田一川口典子日本学術振興会特別研究員▽佐藤陽いわき明星大薬学部薬学科助教▽岩間直子青森県産業技術センター弘前地域研究所バイオテクノロジー部主任研究員▽真壁幸樹山形大大学院理工学研究科准教授▽渡部雄一郎新潟大医学部医学科総合医学教育センター准教授▽森口茂樹東北大大学院薬学研究科講師▽有働恵子東北大災害科学国際研究所准教授

西澤理事長（右）から盾を受け取る受賞者

2015（平成27年）9月4日（金）科学新聞

大学発ベンチャー表彰

文科大臣賞に創晶の安達社長

「支援の輪」拡大期待

国際科学五輪の参加報告

参加者の感想

日経サイエンス　平成27年11月

JST・NEDOの大学発ベンチャー表彰2015

創晶・C&Aなどが受賞

科学技術振興機構（JST）と新エネルギー・産業技術総合開発機構（NEDO）は「大学発ベンチャー表彰2015」の受賞者を決め，8月27日，東京ビッグサイト（東京・江東区）で表彰式を開催した。活躍が期待される大学発ベンチャー企業と，特にその成長に寄与した大学・企業なども表彰対象。2015年はベンチャー8社とその支援大学・企業に決まった。文部科学大臣賞はベンチャー企業の創晶（吹田市，安達宏昭社長），支援大学として大阪大学大学院工学研究科の森勇介教授，支援企業として三菱商事に贈られた。経済産業大臣賞はベンチャー企業のC&A（仙台市，鎌田圭社長），支援大学として東北大学金属材料研究所の吉川彰教授が表彰された。

同表彰は2014年度にスタートし，2015年度からNEDOと共催となった。受賞者の詳細はhttp://www.jst.go.jp/aas/award.html

日経サイエンス

日経サイエンス2015年11月号

Event Photo

4/15 Hanami

4/19 IMR Hanami

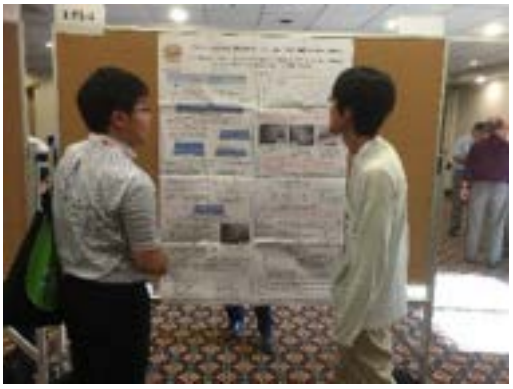
5/29
Farewell Party

6/22-27 UVSOR

7/11 Climbing team

7/16 IMR Beer Party

8/2- ACCGE



8/17-20 Nagasaki Symposium

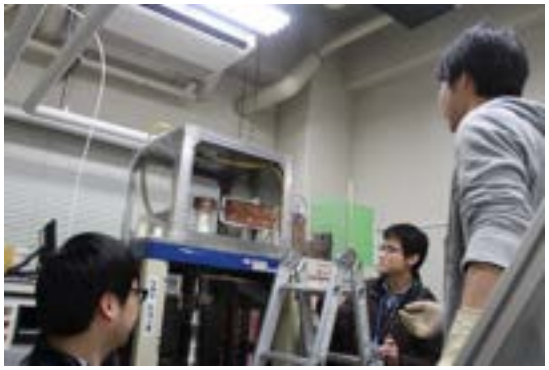
8/27 IMR Volleyball Games

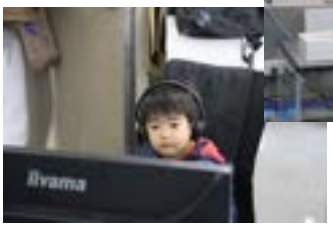
9/21-25 LUMDETR2015

10/23,30 IMR
Futsal

IEEE

One day





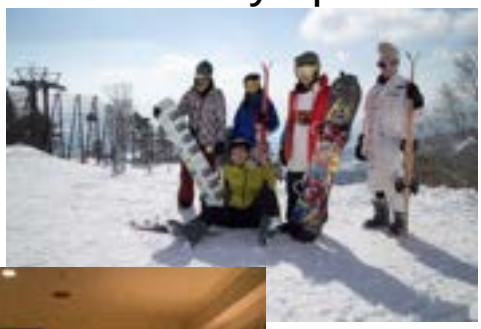
12/25 Year end Party

1/12 Doctor thesis

1/15 New year Party

2/4-5 INTELUM Meeting

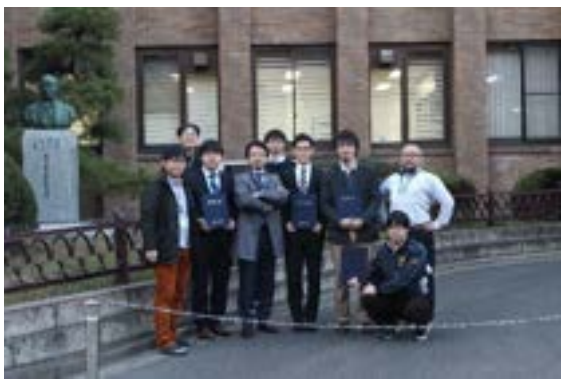
2/6-8 Fukushima Symposium



2/27-3/4 CERN & IS-OM7

3/9 Farewell Party

3/25 Graduation ceremony



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