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Annapolis, Maryland, USA
17 - 21 August 2014

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**The 23rd International Workshop on
Rare Earth and Future Permanent Magnets and Their Applications
(REPM2014)
Annapolis, Maryland USA - August 17-21, 2014**

**SCHEDULE
MONDAY, AUGUST 18, 2014**

8:00 – 8:15 AM – **Opening Remarks**

8:15 – 9:00 AM – **Keynote Address – Dr. Oliver Gutfleisch**

“Re-thinking Rare Earths: Demand, Sustainability and the Reality of Alternatives”

9:00 – 10:30 AM Resources/Markets I [Chair: Constantinides]

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Chinese Society of Rare Earth, Beijing, China

9:22 – 9:44 AM - **Stephen J. Collocott**

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CSIRO Materials Science and Engineering, Lindfield NSW, Australia 2070

9:44 – 10:06 AM - **Roderick G. Eggert**

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Colorado School of Mines, Golden, CO USA

10:06 – 10:18 AM - **Daniel Rodrigues^{1,2}**, Jose Adilson de Castro²,
Marcos Flavio de Campos²

“Perspectives for Rare-Earth Magnets in Brazil” 12
¹BRATS - Sintered Filters and Metallic Powders, Cajamar, São Paulo BRAZIL
² EEIMVR – Federal Fluminense University, Volta Redonda, Rio de Janeiro, Brazil

10:18 – 10:30 AM - **R Gopalan**

“The Indian Rare Earth Scenario – Present and Future”
Centre for Automotive Energy Materials, ARCI, IIT-M Research Park, India

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Critical Materials Institute, The Ames Laboratory, Ames, IA USA

11:07 – 11:29 AM – **G.P. Hatch^{1,2}**

“The Development of Future Sources of Rare-Earth Supply” 19
¹Technology Metals Research, LLC, Carpentersville, IL USA
²Innovation Metals Corp, Toronto, Ontario, Canada

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“Metal and Magnet Value Chain” 24
 President, USMMA
 Vice President, Thomas & Skinner, Inc.

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 I.R. Harris, B. Guerrero*, C. Bagan*, A. Conesa* V. Schaller^
“Recycling of Rare Earth Magnets” 26
 Magnetic Materials Group, University of Birmingham, Edgbaston, Birmingham, UK
 * Leitat Technology Centre - C/ de la Innovació, 2 · 08225 Terrassa, Barcelona, Spain.
 ^ Stiftelsen Chalmers Industriteknik, Chalmers Science Park, Gothenburg, Sweden.

12:13 – 12:25 PM – **Chins Chinnasamy**, Melania Marinescu Jasinski,
 and Jinfang Liu
*“Cost Effective Recycling Process of Industrial Scrap and Hard Drive
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 Electron Energy Corporation Technology Center, Landisville, PA USA

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2:00 – 4:00 PM - Recent Developments in High Performance Magnets [Chair: Gutfleisch]

2:00 – 2:22 PM - **S. Sugimoto**¹, M. Nakamura¹, K. Isogai¹, M. Matsuura¹, Y. Une², H. Kubo²,
 M. Sagawa²
“Recent Progress in High- Performance Magnets” 34
¹Department of Materials Science, Graduate School of Engineering, Tohoku University;
²Intermetallics CO., LTD., JAPAN

2:22 – 2:44 PM - **J.F. Liu**, M. Marinescu
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 Electron Energy Corporation Technology Center, Landisville, PA USA

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 Magnequench Technology Centre, 01-19 The Galen, 61 Science Park Road, Singapore 117525

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 Division of Functional Materials, Central Iron and Steel Research Institute, Beijing, China

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*“Microstructure and Coercivity of Tb₄O₇ Grain Boundary Diffusion Processed
 Sintered (Nd,Dy)-Fe-B Magnets”* 55
¹Elements Strategy Initiative Center for Magnetic Materials (ESICMM)
 National Institute for Materials Science, Tsukuba
²Graduate School of Pure and Applied Sciences, University of Tsukuba
³Magnetic Materials Research Center, Shin-Etsu Chemical Co. Ltd., Japan

3:38 – 3:50 PM - **Michihide Nakamura**¹, Masashi Matsuura¹, Nobuki Tezuka¹,
 Satoshi Sugimoto¹, Yasuhiro Une², Hirokazu Kubo², and Masato Sagawa²
*“Effect of Annealing on Magnetic Properties and Microstructure of
 Ultrafine Nd-Fe-B Powders”* 57
¹Department of Materials Science, Graduate School of Engineering, Tohoku University;
²Intermetallics Co., Ltd, Nagoya 463-0003

COFFEE BREAK – 15 MINUTES

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Siemens AG, Corporate Technology, München, Germany

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Zhao Dajun, Chen Dejin, Li Zhonghua, Wang Yongjie, Zhang Haiyan

*“New Development about Sintered NdFeB Magnets Application Fields and Technology
Upgrade in China”*

Yantai Shougang Magnetic Materials Inc. (YSM), Shandong Province, China

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“The Implementation of Bonded NdFeB Magnets in Electric Machines”
President – ACM Magnetics, Inc.

5:21 – 5:33 PM – **C.H. Chen^{1,4}, J.C. Horwath²** and B.W. Hoff³

*“Axial Magnetic Field and Its Uniformity in Wide-Aperture Permanent
Magnet Solenoids”* 66

¹University of Dayton Magnetics Lab., Dayton, OH USA;

²Air Force Research Laboratory, Propulsion Directorate, Wright-Patterson Air Force Base, OH USA

³Air Force Research Laboratory, Directed Energy Directorate, Kirtland Air Force Base, NM USA

⁴Magnet Energy Corp., San Jose, CA USA

5:35 – 6:45 PM – Thin Film Permanent Magnets [Chair: Suzuki]

5:35 – 5:57 PM – **D.J. Sellmyer¹**, Y. Liu¹, W.Y. Zhang¹, P. Kharel^{1,2}

“Nanostructuring and Properties of Strong Permanent-Magnet Films” 69

¹Nebraska Center for Materials and Nanoscience and Department of
Physics and Astronomy, University of Nebraska, Lincoln, NE USA

²Department of Physics, South Dakota State University, Brookings, SD USA

5:57 – 6:19 PM – **N. M. Dempsey^{1,2}**, D. Le Roy^{1,2}, A. L. Dias^{1,2,3}, H. Marelli-Mathevion^{1,2},
O. Akdogan^{1,2}, S. Ponomareva^{1,2}, G. Shaw^{1,2}, J.F. Motte^{1,2}, F. Marchi^{1,2}, R. Kramer^{1,2},
K. Hasselbach^{1,2}, O. Cugat³, F. Dumas-Bouchiat⁴ and D. Givord^{1,2,5}

“Hard Magnetic Films for Micro-System Applications”

¹Univ. Grenoble Alpes, Inst. NEEL, France; ²CNRS, Inst. NEEL, Grenoble, France; ³Univ. Grenoble Alpes, G2Elab, Grenoble,
France; ⁴Univ Limoges, CNRS, SPCTS, France; ⁵Instituto de Fisica, Universidade Federal do Rio de Janeiro, Brasil

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Graduate School of Engineering, Nagasaki, Japan

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*“Superferrimagnetism in Hard Nd-Fe-B Thick Films, an Original Concept for
Coercivity Enhancement”*

¹Univ. Grenoble Alpes, Institut NEEL, F-38042 Grenoble, France

²CNRS, Institut NEEL, F-38042 Grenoble, France

³Instituto de Fisica, Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brasil

7:00 – 9:00 PM – POSTER SESSION

Posters A – Non-Rare Earth

- AP1 - Konrad Löwe¹**, Farzin Tabary¹, Bianca Frincu¹, Xiacao Hu³,
Oliver Gutfleisch^{1,2} and George C. Hadjipanayis³
*“Effect of Grain Size on Spinodal Decomposition and Magnetic
Properties of Melt-Spun Alnico”* 77
¹TU Darmstadt, Petersenstr. 23, 64287 Darmstadt, Germany
²Fraunhofer ISC, IWKS Group Materials Recycling and Resource Strategy, Hanau, Germany
³Department of Physics and Astronomy, University of Delaware, Newark, DE, USA
- AP2- P. Hernández-Gómez¹**, Xiansong Liu², J. M. Muñoz¹, C. Torres¹ and O. Alejos¹
“Magnetic Relaxation in La-Co Substituted Strontium M-type Hexaferrites” 79
¹Univ. Valladolid, Dpto. Electricidad y Electrónica, 47071 Valladolid, Spain
²Univ. Anhui, School of Physics and Materials Science, Hefei 230039, PR China
- AP3 - V.P. Menushenkov**, M.V. Gorshenkov, E.S. Savchenko, G.G. Zhukov,
A.G. Savchenko, I.V. Shetinin
*“Evolution of the Microstructure and Magnetic Properties of Rapidly Solidified
Fe₂NiAl Alloy during Annealing at 500-780°C”*
National Research Technological University “NITU MISIS”, Moscow, Russia
- AP4 - Yunglong Geng**, Timothy Prost, Michael Lucis and Jeffrey E. Shield
“Microstructural Evolution in Mn-Al-based Permanent Magnet Alloys”
Department of Mechanical & Materials Engineering, Nebraska Center for Materials and
Nanoscience, University of Nebraska-Lincoln
- AP5 - A. Bollero^{*1}**, F.J. Pedrosa¹, K. Golasinski¹, A. Quesada², F. Rubio-Marcos²,
M.N. Guzik³, S. Deledda³, J.F. Fernández², J. Camarero¹, D. Granados¹
“High Coercive Isotropic CoFe₂O₄ Powders Obtained by Ultrafast Milling”
¹IMDEA Nanoscience, Madrid, Spain
²Electroceramic Department, Instituto de Cerámica y Vidrio, CSIC, Madrid, Spain
³Institute for Energy Technology, 2027 Kjeller, Norway
- AP6 - Siqian Zhao¹**, Toshiya Hozumi^{1,2}, Patrick LeClair¹ Gary Mankey¹ and Takao Suzuki¹
“Magnetic and Structural Properties of MnAl Thin Films” 83
¹Center for Materials for Information Technology (MINT), The University of Alabama,
Tuscaloosa, AL USA
²Advanced Technology Development Center, TDK Corporation, Narita, Japan
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Department of Chemical Engineering, Northeastern University, Boston, MA, USA
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¹Department of Physics and Astronomy, University of Delaware, Newark, DE USA
²Nanotechnology and Nanometrology Lab., National Institute for Standards,
Giza 12211, Egypt

**AP9 – Sean Fackler¹, Tieren Gao¹, Ichiro Takeuchi¹, A. Gilad Kusne²,
V. Aleksandrakis³, A. Ludwig³**

*“Combinatorial Search for Rare-Earth-Free Permanent Magnets: Comparison of
Thin Film to Bulk Fe-Co-V Vicalloys”*

¹Department of Materials Science and Engineering, University of Maryland, College Park, MD USA

²National Institute of Standards and Technology (NIST), Gaithersburg, MD USA

³Institute for Materials Ruhr-University, Bochum, Germany

AP10 - Y.L.Sun^{1, 2}, J.T.Zhao^{1, 2}, Z.Liu^{1, 2}, W.X.Xia^{1, 2}, D.Lee^{1, 2}, and A.R.Yan^{1, 2}

“The Phase and Microstructure Analysis of AlNiCo Magnets with High Coercivity”

¹Zhejiang Province Key Laboratory of Magnetic Materials and Application

Technology, Ningbo Institute of Material Technology and Engineering,

Chinese Academy of Sciences, Ningbo, China ²Key Laboratory of Magnetic

Materials and Devices, Ningbo Institute of Material Technology and Engineering,

Chinese Academy of Sciences, Ningbo, China

Posters A – Applications

AP11 - Ryogen Fujiwara¹, Tadahiko Shinshi^{2*}, Elito Kazawa³, Minoru Uehara⁴

“Micro Magnetization Assisted by Laser Heating for Sputtered NdFeB/Ta Multilayered Film”

¹Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Yokohama, Japan

²Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, Japan

³Research and Development Department, Tokyo Metropolitan Industrial Technology Research Institute, Tokyo, Japan

⁴Magnetic Materials Research Laboratory, Hitachi Metals, Ltd., Osaka, Japan

AP12 - H. Allag^{1, 3}, J-P. Yonnet^{1, 2}

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¹Université Grenoble Alpes, G2E Lab, St Martin d’Hères, France

²Centre National de la Recherche Scientifique, G2E Lab, Grenoble, France

³Jijel University, Jijel, Algeria

AP13 - James Murphy

“Magnetization and Measurement of PM Motors”

MAGSYS Magnet Systeme, St. Louis, MO USA

AP-14 - S. Prakash Narayan

“Magnetic Measurements of High Energy Rare Earth Magnets Using HELMHOLTZ Coils”

Mansarovar Institute of Science & Technology (MIST), Bhopal-India

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AP15 - P. Marín, A. M. Aragón, A. García-Escorial, M. Lieblisch and A. Hernando

“Grain Boundaries and Particle Size as a Source of Coercivity Enhancement”

AP16 - Noriyuki Nozawa, Takeshi Murata and Takeshi Nishiuchi

*“Magnetic Properties of Hydrogenation-Disproportionation-Desorption-
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Magnetic Materials Research Laboratory, Magnetic Materials Company, Hitachi Metals, Ltd. Egawa,

Shimamoto, Osaka Japan

AP17 - A.Walton, O.Brooks, A.Pirolini, A.Bradshaw, R.Sheridan, V.S.J.Mann, I.R.Harris

“A Possible New Route for Producing Fine Grained NdFeB-type Magnets”

AP18 - Y. Shen^{1,2}, S. Leontsev^{1,2}, Z. Turgut^{2,3}, A. O. Sheets^{2,3}, N. Bryant^{2,4}, J. C. Horwath²

“Anisotropic Sm-Co/Fe Composite Particles by Surfactant-Assisted High Energy Ball Milling”

¹ University of Dayton, Dayton, OH, USA

² Air Force Research Laboratory, Wright-Patterson Air Force Base, OH, USA

³ UES Inc., Dayton, OH, USA

⁴ Wright State University, Dayton, OH, USA

AP19 - X.C. HU^{1,2}, G.C. HADJIPANAYIS², D.J.SELLMYER³

“Annealing Effect on L1₀ FePt Nanoparticles Prepared by Ball Milling of Layered

Crystal Fe(H₂O)₆PtCl₆” 99

¹Department of Materials Science and Engineering, University of Delaware, DE 19716, USA

²Department of Physics and Astronomy, University of Delaware, DE 19716, USA

³Department of Physics and Astronomy, University of Nebraska, Lincoln, NE 68588, USA

Posters A – Thin Films

AP20 - I.Luciu¹, D. Duday¹, T. Wirtz¹, P. Choquet¹, P. Szary², A. Michels²

“Studies on NdFeB Thin Films Deposited on Microwires”

¹Science and Analysis of Materials (SAM), Centre de Recherche Public, Gabriel Lippmann, Luxembourg

²Physics and Materials Research Unit, University of Luxembourg, Luxembourg

AP21 - T. Furuuchi, H. Iwama, M. Doi and T. Shima

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Tohoku Gakuin University, Tagajo, Japan

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¹Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, NE USA

²Department of Physics and Astronomy, University of Nebraska, Lincoln, NE USA

³Department of Physics, South Dakota State University, Brookings, SD USA

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Tohoku Gakuin University, Tagajo 985-8537, Japan

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Faculty of Science and Engineering, Chuo University, Tokyo 112-8551, Japan

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“Rapid Production of Highly Coercive Sm-Co Thin Films by Triode Sputtering”

¹Univ. Grenoble Alpes, Institut NEEL, F-38042 Grenoble, France

²CNRS, Institut NEEL, F-38042 Grenoble, France

³Instituto de Fisica, Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brasil

AP26 - Ataru Suzuki¹, Takato Yanagawa¹, Yusuke Hotta¹, Makoto Yamada¹, Mitsuru Ohtake¹, Fumiyoshi Kirino², and Masaaki Futamoto¹
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¹ Faculty of Science and Engineering, Chuo University, Tokyo 112-8551, Japan

² Graduate School of Fine Arts, Tokyo National University of Fine Arts and Music, Tokyo, Japan

AP27 - N. Gunduz Akdogan^{1,2}, N. M. Dempsey^{1,2}, D. Givord^{1,2,3}, A. Manabe⁴, T. Shoji⁴, M. Yano⁴ and A. Kato⁴
“Effect of Rapid Thermal Annealing on Thick and Thin Nd-Fe-B films Prepared by Sputtering”

¹Univ. Grenoble Alpes, Inst NEEL, Grenoble, France. ²CNRS, Inst NEEL, Grenoble, France. ³Instituto de Fisica,

Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brasil. ⁴Toyota Motor Company, Shizuoka, Japan

AP28 - Marcos Flavio de Campos¹, Fernanda A. Sampaio da Silva¹, Daniel Rodrigues¹, Jose Adilson de Castro¹
“Crystallographical Texture and Coercivity in Nanosize Thin Films for Magnetic Recording”

¹UFF – Universidade Federal Fluminense – Volta Redonda RJ BRAZIL

AP29 - V. Madurga, C. Favieres, J. Vergara
“Exploring on the Ability of the Glancing Angle Deposition to Produce High Anisotropic Magnetic Films with High Coercivity”

Laboratory of Magnetism. Department of Physics. Public University of Navarre. Campus de Arrosadía s/n. E-31006, Pamplona, Spain

Posters A – Nd-Fe-B Sintered Magnets/Recycling

AP30 - W. Q. Liu^{1*}, C. Li¹, M. Zakotnik^{1*}, M. Yue¹, D. T. Zhang¹, T. Y. Zuo²
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¹College of Materials Science, Beijing University of Technology, Beijing, China

²Institute of Recycling Economy, Beijing University of Technology, Beijing, China

AP31 - Roland Gauß¹, Konrad Güth¹, Alex Buckow¹, Almut Dirks, Gert Homm¹, Armin Reller^{1,2}, Stefan Gäth^{1,3}, Oliver Gutfleisch^{1,4}

“Rare Earth Permanent Magnets: Options for Substitution and Recycling of Critical Metals”

¹Fraunhofer Project Group Materials Recycling and Resource Strategies IWKS, Hanau, Germany

²Department of Physics, Resource Strategy, Augsburg University, Germany

³Waste Management and Environmental Research, Justus Liebig University, Giessen, Germany

⁴Department of Material Science, Functional Materials, TU Darmstadt, Germany

AP32 - Akira Sugawara*, Takeshi Nakayama, Kazuhiro Ueda, Noriyuki Lee and Hiroyuki Yamamoto

“Magnetic hysteresis loops of micrometer-size Nd-Fe-B magnets measured using microbeam X-ray magnetic circular dichroism”

Central Research Laboratory, Hitachi Ltd., Akanuma 2520, Hatoyama, Saitama Japan

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Division of Functional Materials, Central Iron & Steel Research Institute, Beijing China

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¹ MAGMA-Labmat, Department of Mechanical and Materials Engineering, UFSC - Brasil

² Fraunhofer IFAM, Bremen – Germany

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Jun Hoshijima, Futoshi Kuniyoshi

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Hitachi Metals Ltd., 2-15-17 Egawa, Shimamoto-cho, Mishima-gun, Osaka, Japan

AP36 - Q.Y. Zhou, A.R. Yan

*“Effect on Magnetic Performance and Corrosion Behaviors of Sintered
NdFeB Magnets after Refractory Metal Substitution”*

Iningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences

AP37 - M. W. Lee¹, D. R. Dhakal¹, T. S. Jang¹, T. H. Kim², S. R. Lee², H. J. Kim³

*“Temperature effect on microstructure and magnetic properties of
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¹⁾ Department of Hybrid Engineering, Sunmoon University, Asan Republic of Korea

²⁾ Department of Materials Science and Engineering, Korea University, Seoul Republic of Korea

³⁾ R&D Center of Jahwa Electronics Co. Ltd, Cheongwon Republic of Korea

AP38 - Miha Zakotnik, Peter Afiuny, and Catalina O. Tudor

“Mass Production of Recycled NdFeB-type Sintered Magnets”

Urban Mining Technology Co., Perryville, MD USA



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**SCHEDULE
TUESDAY, AUGUST 19, 2014**

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University of Nebraska, Lincoln, NE

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Graduate School of Engineering, Nagasaki University, Bunkyo-machi 1-14, Nagasaki 852-8521, Japan

8:44 – 9:06 AM – **J.S. Jiang**

*“Rational Design of the Nanocomposite Structure for High-Performance
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Argonne National Laboratory, Argonne, IL USA

9:06 – 9:28 AM – V. Neu, M. Kopte, **S. Sawatzki**, Ch. Damm, and L. Schultz

“Exchange Coupled SmCo₅/Fe(Co) Multilayers”
IFW Dresden, Institute for Metallic Materials, Helmholtzstr. 20, D-01069 Dresden, Germany

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*“Preparation, Microstructure and Mechanism of NdFeB-based Multilayer
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National Institute for Materials Science (NIMS), Sengen 1-21-1, Tsukuba, Ibaraki, Japan

9:50 – 10:12 AM – **Y. Hou**

“Chemical Synthesis of Exchange-Coupled Magnets”
Department of Materials Science and Engineering, Peking University

10:12 – 10:24 AM – Min Lin¹, Huijie Wang², **Aru Yan**¹

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¹Ningbo Institute of Material Technology & Engineering Chinese Academy of Science, Ningbo, People’s Republic of China
²Ningbo Jinji Strong Magnetic Material Company, Ningbo, People’s Republic of China

COFFEE BREAK – 15 MINUTES

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10:45 – 10:57 AM – **K. Takagi**¹, M. Ishii², R. Soda¹, K. Ozaki¹

*“Microstructure and Magnetic Properties of Fine-Grained Nd-Fe-B Sintered Magnets Derived from
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¹National Institute of Advanced Industrial Science and Technology (AIST), Nagoya, Japan

²Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM), Nagoya, Japan

10:57 – 11:09 AM – K. Löwe ¹ , C.Brombacher ² , M. Katter ² , O. Gutfleisch ^{1,3} <i>“Temperature Dependent Dy Diffusion Processes in Nd-Fe-B Permanent Magnets”</i>	
¹ TU Darmstadt, Darmstadt Germany, ² Vacuumschmelze GmbH & Co., Hanau, Germany ³ IWKS Hanau, Fraunhofer-Projektgruppe für Wertstoffkreisläufe und Ressourcenstrategie, Hanau, Germany	
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Daido Steel Co., Ltd., Minami-ku, Nagoya Japan	
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Tohoku Gakuin University, Tagajo, Japan	
11:33 AM – 11:45 AM - C. Chang, W. Q. Liu , D. Wu, M. Yue, D. T. Zhang, T. Y. Zuo <i>“Coercivity Enhancement of Bulk Sintered Nd-Fe-B Magnets by DyH₃ Nanoparticles Grain Boundary Diffusion”</i>	157
¹ College of Materials Science, Beijing University of Technology, Beijing, China ² Institute of Recycling Economy, Beijing University of Technology, Beijing, China	
11:45 – 11:57 PM - Jung-Goo Lee ^{a,*} , Hee-Ryoung Cha ^a , Shu Liu ^a , Ji-Hun Yu ^a , Hae-Woong Kwon ^b <i>“Thermal Stability of Nd-Fe-B HDDR Powder and Hot-Pressed Compact”</i>	160
^a Powder & Ceramics Division, Korea Institute of Materials Science, Changwon, Korea ^b Department of Materials Science and Engineering, Pukyong National University, Nam-Gu, Busan, Korea	
11:57 – 12:09 PM – Fangming Wan , Jingzhi Han, Yingchang Yang, Jinbo Yang <i>“Improvement of Coercivity and Thermal Stability of Nd-Fe-B-Type Magnetic Powders by Alloy Diffusion”</i>	163
State Key Laboratory for Mesoscopic Physics, and School of Physics, Peking University, Beijing China	
12:09 – 12:21 PM – W. Tang , L. Zhou, K.W. Dennis, M. J. Kramer, I. E. Anderson and R. W. McCallum <i>“Microstructure and Magnetic Properties of Zn-coated (Nd,Dy,Y)-(Fe,Co)-B Ribbon Powder and Subsequent Hot Deformed Magnets”</i>	166
Ames Laboratory (USDOE), Iowa State University, Ames, IA USA	

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2:00 – 4:00 PM Status of Permanent Magnets Around the World

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Arnold Magnetic Technologies, Rochester, NY USA	
2:22 – 2:44 PM – Shengzhi Dong ^{*1} , Yang Luo ² , Wei Li ¹ <i>“Development of Rare Earth Permanent Magnets in China”</i>	175
¹ Central Iron & Steel Research Institute, Beijing, China ² IEEE TC-15 Voting Member, Beijing, China	

2:44 – 3:06 PM - **T. Iriyama**
“Recent Trends and Perspectives on Development of Permanent Magnets in Japan” 180
 Daido Steel Co., Ltd./Intermetallics Co., Ltd., Nagoya 457-8545, Japan

3:06 – 3:28 PM – **M. Katter**
“The Status of Rare Earth Permanent Magnets in Europe” 189
 Vacuumschmelze GmbH & Co. KG, Hanau, Germany

3:28 – 3:50 PM – **A.G. Dormidontov**¹, A.S. Lileev², N.V. Kudrevatikh³
“Status of Permanent Magnets in the World: Russia” 194
¹JSC “SPETSMAGNIT”, Moscow, Russia; ²National Research University “MISIS”, Moscow, Russia;
³Ural Federal University, Yekaterinburg, Russia

COFFEE BREAK – 15 MINUTES

4:15 – 5:50 PM Novel Synthesis and Processing Techniques

4:15 – 4:27 PM - **Melania Marinescu**¹, Jun Cui², Glen Grant², Saumyadeep Jana²,
 Jens Darsell², Matthew J. Kramer³, Jinfang Liu¹
“Rare Earth Based Permanent Magnets Processed by Friction Consolidation and Extrusion” 203
¹Electron Energy Corporation, Landisville PA
²Pacific Northwest National Laboratory, Richland WA
³Ames Laboratory, Ames IA

4:27 – 4:39 PM – **Andraz Kocjan**, Spomenka Kobe and Paul McGuiness
“The Rapid Densification of Nd-Fe-B Materials Using Spark-Plasma Sintering”
 Department for Nanostructured Materials, Jožef Stefan Institute, Ljubljana, Slovenia

4:39 – 4:51 PM - **Ami Berkowitz**¹, Phi-Khanh Nguyen¹ and David J. Smith²
“MnBi Single Domain Particles Produced by Spark Erosion” 206
¹University of California-San Diego, La Jolla, CA
²Arizona State University, Tempe, AZ

4:51 – 5:03 PM – **B. Hugonnet**⁽¹⁾, G. Largiller⁽¹⁾, F. Servant⁽¹⁾, **C. Rado**⁽¹⁾, J.M. Missiaen^(2,3)
“Sintering Analysis of NdFeB Materials” 209
¹CEA, LITEN, 17 rue des Martyrs, F-38054 Grenoble, France
²Univ. Grenoble Alpes, SIMAP, F-38000 Grenoble, France
³CNRS, SIMAP, F-38000 Grenoble, France

5:03 – 5:15 PM – **A.G. Popov**¹, V.S. Gaviko¹, P.B. Terentev¹, T.I. Gorbunova²,
 N.V. Pechischeva³, G.C. Hadjipanayis⁴
“Effect of Internal Lubricants on Microstructure and Magnetic Properties of Sintered Nd-Fe-B Magnets Produced by PLP” 212
¹Institute of Metal Physics, UB of the RAS, Russia, 620990, Ekaterinburg
²Institute of Organic Synthesis, UB of the RAS, Russia, 620137, Ekaterinburg
³Institute of Metallurgy, UB of the RAS, Russia
⁴University of Delaware, 217 Sharp Lab, Newark, DE USA

5:15 – 5:27 PM – Lopes, L.U.¹, Santos, E.C.¹, N. Uenal³, Hartwig, T.² and Wendhausen, P.A.P.¹ <i>“Investigation of the Influence of Carbon on the Magnetic Properties of Powder Injection Molded Nd-Fe-B Magnets”</i>	215
¹ MAGMA-Labmat, Department of Mechanical and Materials Engineering, UFSC – Brasil ² Instituto SENAI de Inovação em Laser, FIESC-SENAI-Brazil ³ Fraunhofer IFAM, Bremen – Germany	
5:27 – 5:39 PM – Haibo Feng , Anhua Li, Shulin Huang, Yanfeng Li, Minggang Zhu, Weixing Xia, Wei Li <i>“Coercivity Enhancement of the Sintered Magnets with Blending Magnetic Grains”</i>	218
Division of Functional Materials, Central Iron & Steel Research Institute, China Iron and Steel Research Institute Group, Beijing, P.R.China	
5:39 – 5:51 PM – M. Zakotnik , C.O. Tudor <i>“Mass Production of Recycled NdFeB-type Sintered Magnets and a Novel Grain Boundary Modification Process”</i>	220
Urban Mining Technology, Co., Perryville, MD USA	
5:55-7:25 PM Theory: Micromagnetics	
5:55 – 6:17 PM – H. Kronmueller¹ , D. Goll ² , J. B. Yang ³ , Y. B. Yang ³ , Y. Chen ¹ , E. Goering ¹ <i>“Micromagnetic Analysis of Hardening Mechanisms in Supermagnets”</i>	226
¹ Max Planck Institute for Intelligent Systems, Heisenbergstr. 3, Stuttgart, Germany ² Material Research Institute, Aalen University, Beethovenstr. 1, Aalen, Germany ³ Department of Physics, State Key Laboratory for Mesoscopic Physics, Peking University, Beijing P. R. of China	
6:17 - 6:39 PM – Josef Fidler , Ahmad Asali, Gregor Zickler, Peter Toson, Wolfgang Wallisch and M. Hajduga <i>“Ab-Initio and Micromagnetic Calculations on Permanent Magnets”</i>	231
Vienna University of Technology, Institute of Solid State Physics, Wiedner Hauptstr. Vienna, Austria.	
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¹ Dep. of Technology, St Pölten University of Applied Sciences, Austria ² Univ. Grenoble Alpes, Inst NEEL, Grenoble, France ³ CNRS, Inst NEEL, F-38042 Grenoble, France ⁴ Toyota Motor Corp., Toyota City, Japan ⁵ CEMPS, University of Exeter, Exeter, UK ⁶ Center for Integrated Sensor Systems, Danube University Krems, Austria ⁷ Instituto de Física, Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brasil	
7:01 – 7:13 – Johann Fischbacher , Simon Bance, Thomas Schrefl <i>“Micromagnetics for the coercivity of composite permanent magnets”</i>	241
St. Poelten University of Applied Sciences, Matthias Corvinus St. Poelten, Austria	
7:13 – 7:25 PM – Aleksander L. Wysocki and Vladimir P. Antropov <i>“Finite Temperature Micromagnetic Simulations of Nd₂Fe₁₄B/Fe Composites”</i> Ames Laboratory, Ames, IA USA	

7:30 BANQUET

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8:00 - 8:12 - Shuk Rashidi -

"Karl Srnat Narrative"

8:12 - 9:00 – Dinner

9:00 - 9:30 - M.J.D. Coey

***"How Magnetism Has
Changed the World - Three
Times"***

9:30 - 10:00 - Dessert



**The 23rd International Workshop on
Rare Earth and Future Permanent Magnets and Their Applications
(REPM2014)
Annapolis, Maryland USA - August 17-21, 2014**

**SCHEDULE
WEDNESDAY, AUGUST 20, 2014**

8:00 – 10:20 AM Non-Rare Earth Magnets I

- 8:00 – 8:22 AM - **Jinbo Yang**^{1,2}, Y.B. Yang¹, H. Zhao¹ and Y.C. Yang¹
“Nanocrystalline MnBi with High Degree of Texture and Coercivity” 244
¹State Key Laboratory for Mesoscopic Physics, School of Physics, Peking University, Beijing, P.R. China
²Collaborative Innovation Center of Quantum Matter, Beijing, China
- 8:22 – 8:44 AM **Laura H. Lewis**
“Prospects of Chemically-Ordered FeNi (Tetrataenite) for Permanent Magnet Development” 248
Department of Chemical Engineering, Northeastern University, Boston, MA USA
- 8:44 – 9:06 AM - Lin Zhou^{*}, Wei Tang, H. Dillon, R.W. McCallum, I. E. Anderson,
and **M. J. Kramer**
“Role of the Applied Magnetic Field on the Microstructural Evolution in alnico 8 Alloys” 252
Ames Lab, Ames, IA USA
- 9:06 – 9:28 AM - **Maogang Gong** and **Shenqiang Ren**
“Templated Growth of Magnetic FeCo Nanostructures” 255
Department of Chemistry, University of Kansas, Lawrence, KS, USA
- 9:28 – 9:40 AM – **S.Ener**¹, K.P. Skokov¹, I. Radulov¹, H. Jian¹, M.D. Kuz'min¹, A. Edström²,
J. Ruzs², O. Eriksson² and O. Gutfleisch¹
“Mastering Magnetic Anisotropy by Small Substitution of 3d-5d Elements in (Fe,Co)2B Single Crystals”
¹Technische Universität Darmstadt, Institute of Materials Science, Darmstadt/ Germany
²Uppsala University, Department of Physics and Astronomy, Uppsala/Sweden
- 9:40 – 9:52 AM - **T. Mix**^{1,2}, L. Schultz^{1,2} and T.G. Woodcock¹
“Crystal Structure and Hard Magnetic Properties of Mn-Ga Compounds” 259
¹IFW Dresden, Institute for Metallic Materials, Dresden, Germany
²Department of Physics, TU Dresden, Dresden, Germany
- 9:52 – 10:04 AM - **Toshiya Hozumi**^{1,2}, Patrick LeClair¹ and Gary Mankey¹, Takao Suzuki¹
“Magnetic Anisotropy and Coercivity Mechanism of LTP MnBi Thin Films” 262
¹Center for Materials for Information Technology (MINT), The University of Alabama, Tuscaloosa, AL, USA
²Advanced Technology Development Center, TDK Corporation, Narita, Japan

9:40 – 9:52 AM - Zachary J. Huba¹, Kyler J. Carroll¹, Vincent G. Harris², **Everett E. Carpenter¹**
“Enhancing the Magnetic Properties of High Aspect Ratio Co_xC particles through Post Synthetic Processing” 265
¹Virginia Commonwealth University, Richmond, VA USA
²Northeastern University, Boston, MA USA

COFFEE BREAK – 15 MINUTES

10:45 - 12:30 AM Non-Rare Earth Magnets II

10:45 – 11:07 AM – B Zande¹, S Simizu¹, R.T. Obermyer¹, A Margolin¹ and **S.G. Sankar¹**,
 S Bennett², M Feygenson² and V Lauter²
“Review of Synthesis and Characterization of Fe₁₆N₂ Powder” 268
¹Advanced Materials Corporation, Pittsburgh, PA
²Oak Ridge National Laboratory, Oak Ridge, TN USA

11:07 – 11:29 AM - **M.Takahashi¹**, Y.Ogata¹, M.Tobise¹, N.Kobayashi²
“α"-Fe16N2 compound nanoparticles - magnetic properties and magnetic reversal mechanism”
¹New Industry Creation Hatchery Center, Tohoku University, Sendai, Japan
²Research and Development Division TODA Kogyo Corporation, Ohtake, Hiroshima, Japan

11:29 – 11:51 AM - **Jian-Ping Wang** and Yanfeng Jiang
“Fe16N2: a 40-year mystery material and its promise for next generation rare-earth-free magnet”
 University of Minnesota, Minneapolis, MN USA

11:51 – 12:03 PM - **I. Dirba**, D. Bick, D. Goelden, J. Kurian, O. Gutfleisch and L. Alff
“Investigation on the formation of Fe₁₆N₂ iron nitride by Reactive Molecular Beam Epitaxy”
 Institut für Materialwissenschaft, TU Darmstadt, Alarich-Weissstr. 2, 64287 Darmstadt, Germany

12:03 – 12:15 PM - **Anja Backen^{1,2}**, Damien Le-Roy^{1,2}, Ozan Akdogan^{1,2},
 Nilay Gunduz-Akdogan^{1,2}, Dominique Givord^{1,2,3}, Nora M. Dempsey^{1,2}
“Surface anisotropy in patterned FeCo thin films”
¹CNRS, Institut Néel, UPR 2940, 25 rue des Martyrs, BP166, 38042 Grenoble Cedex 9, France
²Univ. Grenoble Alpes, Institut Néel, 38042 Grenoble, France
³Instituto de Fisica, Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brazil

12:15 – 12:27 PM - **V.P. Menushenkov**, M.V. Gorshenkov, I.V. Shetinin, E.S. Savchenko
“Microstructure evolution and magnetic properties of as-cast Fe2NiAl alloy during cooling after homogenization at a critical rate” 272
 National University of Science and Technology “MISIS”

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2:00 – 4:00 PM SYMPOSIUM: Coercivity-Grain Boundary Phases

2:00 – 2:22 PM - **K. Hono**, H. Sepehri-Amin, T. Akiya, J. Liu, T. Ohkubo, K. Hioki, A. Hattori
“Dy-Free High Coercivity Nd-Fe-B Hot Deformed Magnets”
 Elements Strategy Initiative Center for Magnetic Materials (ESICMM), National Institute for Materials Science (NIMS, Tsukuba 305-0047 Japan)

2:22 – 2:44 PM - T. Nakamura¹, A. Yasui¹, Y. Kotani¹, T. Fukagawa², T. Nishiuchi², H. Iwai³,
T. Akiya³, T. Ohkubo³, K. Hono³, S. Hirose³, and Y. Gohda⁴

*“Magnetism of Grain-boundary Phase in Nd-Fe-B Sintered Magnets Studied with
Soft X-ray Magnetic Circular Dichroism Technique”*

¹ Japan Synchrotron Radiation Research Institute, 1-1-1, Kouto, Sayo-cho, Sayo-gun, Hyogo 679-5198 Japan

² Magnetic Materials Research Laboratory, NEOMAX Div., Hitachi Metals, Ltd., 2-15-17 Egawa, Shimamoto, 618-0013, Japan

³ National Institute for Materials Science, Tsukuba 305-0047, Japan

⁴ Department of Physics, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

2:44 – 3:06 PM - Takuya Yoshioka¹, **Hiroki Tsuchiura**¹, and Pavel Novák²

“First-principles study on magnetization easy-axis and crystal field

parameters in R₂Fe₁₄B systems” 276

¹ Department of Applied Physics, Tohoku University, Sendai, Japan

² Institute of Physics of ASCR, Prague, Czech Republic

3:06 – 3:28 PM - **G. Hrkac**¹, K. Butler³, T.G. Woodcock², T. Schrefl⁴, and O. Gutfleisch^{5,2}

“Impact of different Nd-rich and Cu doped crystal-phases on the coercivity of Nd-Fe-B

grain ensembles” 279

¹ College of Engineering, Mathematics and Physical Sciences, Univ. of Exeter, UK

² IFW Dresden, Institute for Metallic Materials, 01171 Dresden, Germany

³ Centre for Sustainable Chemical Technologies, University of Bath, Bath, UK

⁴ St. Pölten University of Applied Sciences, Matthias Corvinus Str. 15, Austria

⁵ TU Darmstadt, Institute for Materials Science, Petersenstr. 23, Darmstadt, Germany

3:28 – 3:40 PM – **A. Sakuma**^{1,2}

*“Theoretical Study on the Magnetic Properties of Nd-Rich Grain-Boundary Phase of
Nd-Fe-B Magnets”*

¹ Department of Applied Physics, Tohoku University, Aoba 6-6-05, Aoba-ku, Sendai 980-8579, Japan

² CREST, Japan Science and Technology Agency, Aoba 6-6-05, Aoba-ku, Sendai 980-8579, Japan

3:40 – 3:52 PM - **T.G. Woodcock**¹, Q.M. Ramasse², T. Shoji³, M. Yano³, A. Kato³ and
O. Gutfleisch⁴

“Phase Boundaries in Hot Deformed Nd-Fe-Co-B-Ga Magnets Infiltrated with a

Nd-Cu Eutectic Liquid” 282

¹IFW Dresden, PO Box 270116, 01171 Dresden, Germany

²SuperSTEM Laboratory, STFC Daresbury Campus, Daresbury, WA4 4AD, UK

³Advanced Material Engineering Div., Toyota Motor Corporation, Susono 410-1193 Japan

⁴Materialwissenschaft, TU Darmstadt, Alarich-Weiß-Str. 16, 64287 Darmstadt, Germany

COFFEE BREAK – 15 MINUTES

4:15 – 5:35 PM Theory: Fundamental

4:15 – 4:37 PM - **Priyanka Manchanda**¹, Ralph Skomski¹ and Arti Kashyap²

“Supercell Calculations of Magnetization, Exchange, and Anisotropy” 285

¹Physics and Astronomy and NCMN, University of Nebraska, Lincoln, NE, USA,

²School of Basic Sciences, Indian Institute of Information Technology, Mandi,
Himachal Pradesh, India

4:37 – 4:59 PM - **O. Mryasov**^{1,2}, S. Okatov², J. Barker², S. Faleev², Yu. Gornostyrev²

*“Understanding magnetization, magnetic anisotropy and their temperature dependence: manganese
and iron based ferromagnets with large anisotropy”*

¹Department of Physics, University of Alabama, Tuscaloosa, USA

²MINT Center, University of Alabama, Tuscaloosa, USA

4:59 – 5:11 PM - **Liqin Ke**, Denys Kukusta, and Vladimir Antropov
“Analysis of magnetic anisotropy in doped Ce₂Co₁₇ magnets”
 Ames Laboratory US DOE, Ames, IA USA

5:11 – 5:23 PM - **Miroslaw Werwinski**, Jan Ruzs, Alexander Edström, and Erna Delczeg-Czirjak
“Ab-initio calculations of magnetocrystalline anisotropy of FeCo special quasirandom structures with B, C or N”
 Uppsala University, SE-75120 Uppsala, Sweden

5:23 – 5:35 PM - **Renu Choudhary**,^{1,2} Pankaj Kumar,¹ Priyanka Manchanda,² Yi Liu,² Arti Kashyap,¹ D. J. Sellmyer², and Ralph Skomski²
“Atomic Magnetic Properties of Pt-Lean FePt and CoPt Derivatives” 289
¹School of Basic Sciences, Indian Institute of Technology, Mandi, Himachal Pradesh, India
²Department of Physics and Astronomy and NCMN, University of Nebraska, Lincoln, NE USA

5:35 – 7:05 PM Applications II

5:35 – 5:57 PM - T. Kondo¹, **Y. Asano**¹, A. Yamagiwa¹, and K. Ohyama²
“Recent Advances in High Performance Permanent Magnet Motors” 292
¹Technology Research Association of Magnetic Materials for High-Efficiency Motors, Osaka, Japan
²Daikin Industries, Ltd. Environmental Technology Laboratory, Kusatsu, Japan

5:57 – 6:19 PM - G. Martinek¹, U. Wyss², D. Maybury², **S. Constantinides**³
“Optimizing Magnetic Effects through Shaped Field Magnets” 297
¹Arnold Magnetic Technologies, Donaustrasse 7, Hanau, Germany
²Arnold Magnetic Technologies, Lupfig, Switzerland
³Arnold Magnetic Technologies, Rochester, NY USA

6:19 – 6:41 PM - **Heeju Choi** and Jinfang Liu
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 Electron Energy Corporation, Landisville, PA USA

6:41 – 6:53 PM - Eobin Alex George¹, Gaurav Tiwari² and **S. Prakash Narayan**²
“High Energy Magnets to Harness Energy from Sea Waves” 303
¹Yoyo Aerospace and Automation, Kochi (India)
²Mansarovar Institute of Science & Technology (MIST), Bhopal-462042 (India)

7:00 – 9:00 PM – POSTERS

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 Physics and Astronomy, University of Delaware, Newark, DE USA

BP2 - G.Obara and K.Kusaka #77
“Magnetic Properties of Pr-Ce-Fe-Co-B System Melt-Spun Ribbons” 310
 School of Science and Technology, Meiji University, 1-1-1 Higashimita, Tama-ku, Kawasaki Japan

BP3 – Zhi-An Chen, Xiao-Lei Rao, E Niu, Bo-Ping Hu
“Effect of Dy/Y/Gd/Ho substitution on magnetic properties and microstructure of nanocrystalline monophasic Nd-Fe-B magnets” 313
 Beijing Zhong Ke San Huan Research, Beijing, China

BP4 - Muhammad Asif Warsi, John Q. Xiao
"Fabrication and Magnetic Properties of Electrospun Fe₆₅Co₃₅ Nanowires and Nanotubes for Exchange Coupled Permanent Magnets" 317
 Physics and Astronomy, University of Delaware, Newark, DE USA

BP5 - M. Yue¹, C. G. Wang¹, C. Zhou¹, D. T. Zhang¹, W. Q. Liu¹, Q. M. Lu¹, Z. H. Guo², and W. Li¹
"Microstructure and Crystallographic Texture Evolution in Hot Deformed SMCO₅ Permanent Magnet" 320
¹ College of Materials Science and Engineering, Beijing University of Technology, Beijing China
² Division of Functional Materials, Central Iron and Steel Research Institute, Beijing, China

BP6 - Bin Qi and David P. Arnold
"Fabrication of Size-Tunable Monodisperse Nd₂Fe₁₄B@CoFe₂Nanocomplexes" 323
 University of Florida, Gainesville FL USA

BP7 - F.J. Pedrosa^{*1}, J.L.F. Cuñado^{1,2}, J. Camarero^{1,2}, M. Seifert³, V. Neu³, V. Baltz⁴, D. Serantes⁵, O. Chubykalo-Fesenko⁵, R.P. del Real⁵, M. Vázquez⁵, L. Schultz³, B. Dieny⁴, and A. Bollero^{*1}
"Unprecedented tuning of the magnitude and sign of the loop shift in orthogonally coupled SmCo₅ (perpendicular) / CoFeB (in-plane) bilayers"
¹ IMDEA Nanoscience, Madrid, Spain
² Dep. de Física Materia Condensada, Inst. Nicolás Cabrera, UAM, Madrid, Spain
³ IFW Dresden, Institute for Metallic Materials, Dresden, Germany
⁴ SPINTEC, UMR-8191 CNRS/CEA-INAC/UJF-Grenoble, France
⁵ ICMM, Instituto de Ciencias de Materiales de Madrid, CSIC, Madrid, Spain

BP8 - X. Jiang^{1,2}, B. Balamurugan^{2,3}, J. E. Shield, and Yunlong Geng^{1,2}
"Structural and highly coercive magnetic properties of Fe modified Sm-Co nanocrystalline alloys"
¹Department of Mechanical & Materials Engineering, University of Nebraska, Lincoln, NE USA
²Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, NE USA
³Department of Physics and Astronomy, University of Nebraska, Lincoln, NE USA

BP9 - Yoshiaki Kinemuchi^{1,2}, Kazuyuki Suzuki^{1,2}, Atsuya Towata^{1,2}, Masaki Yasuoka^{1,2}, Shusuke Okada^{1,2}, Kenta Takagi^{1,2} and Kimihiro Ozaki^{1,2}
"Synthesis of well-dispersed α'-Fe₁₆N₂ particles" 326
¹ National Institute of Advanced Industrial Science and Technology (AIST), Nagoya Japan
² Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM), Nagoya Japan

BP10 - Daniel Salazar¹, J. Manuel Barandiarán^{1,2}, Rajasekhar Madugundo³ and George C. Hadjipanayis³
"Coercivity Enhancement in Nanocomposite Nd-Fe-B Alloys by Pr-diffusion" 329
¹BCMaterials, Camino de Ibaizabal, Edificio 500, Planta 1. Parque Científico y Tecnológico de Zamudio, 48160 Derio, Spain
²University of the Basque Country, Faculty of Science and Technology, P.O. Box 644, 48080 Bilbao, Spain
³Department of Physics and Astronomy, University of Delaware, USA

Posters B – Grain Boundary Engineering in NdFeB Magnets

BP11 - K. M. Kim⁽¹⁾, M. A. Matin⁽¹⁾, H. W. Kwon⁽¹⁾, J. G. Lee⁽²⁾, J. H. Yu⁽²⁾
"Coercivity of Thermally or Mechanically Treated Nd-Fe-B-Type HDDR Material" 332
⁽¹⁾ Pukyong National University, Busan, South Korea
⁽²⁾ Korea Institute of Materials Science, Changwon, South Korea

- BP12 - S. Sawatzki¹, S. Ener¹, Chr. Kübel², and O. Gutfleisch^{1,3}**
“Effect of DyCu dp[omg of hot-compacted and die-upset Nd-Fe-B magnets” 335
¹TU Darmstadt, Materialwissenschaft, 64287 Darmstadt, Germany
²KIT, Institute of Nanotechnology INT, 76021 Karlsruhe, Germany
³IWKS Hanau, Fraunhofer-Projektgruppe für Wertstoffkreisläufe und Ressourcenstrategie, 63457 Hanau, Germany
- BP13 - Damien Le Roy^{1,2}, Ozan Akdogan^{1,2}, Nora Dempsey^{1,2}, Dominique Givord^{1,2,3}**
“Model systems for grain surface engineering in Nd-Fe-B magnets”
¹Univ. Grenoble Alpes, Inst. NEEL, F-38042 Grenoble, France
²CNRS, Inst. NEEL, F-38042 Grenoble, France
³Instituto de Física, Universidade Federal do Rio de Janeiro, Rio de Janeiro RJ, Brasil
- BP14 - Jose Adilson de Castro¹, Daniel Rodrigues¹, Marcos Flavio de Campos¹**
“A Microstructural model for the Dysprosium Diffusion in NdFeB magnets from a Surface Layer”
 UFF – Universidade Federal Fluminense – Volta Redonda RJ BRAZIL
- BP15 - C. Brombacher*, K. Uestuener, F.-J. Boergermann, and M. Katter**
“GRAIN-BOUNDARY-DIFFUSION OF PR-FE-B MAGNETS FOR CRYOGENIC APPLICATIONS” 339
 Vacuumschmelze GmbH & Co. KG, Grüner Weg 37, 63450 Hanau, Germany
- BP16 - G. Suppan††*, M. Ruehrig‡, C. Brombacher§, M. Katter§,**
“Grain Boundary Diffusion in Nd-Fe-B Permanent Magnets using an Electrochemical HRE Deposition Process” 342
 †Institute of Physical and Theoretical Chemistry, University of Regensburg, Germany,
 ‡Siemens AG, Erlangen, Germany, §Vacuumschmelze GmbH & Co. KG, Hanau, Germany
- BP17 - Pan Shuming Li Shouyi*** David Wong*** Liu jinfang Li Zhengwen****
 MaRuzhang** Pan Feng
“The Development, Process and Prospect of Rare Earth Permanent Magnetic Materials” 345
 General Research Institute for Non-ferrous Metals, Beijing, China
 ***Feller Magnets Corporation
 **Beijing University of Science and Technology, Beijing, China
- BP18 - B. Z. Cui*, M. Marinescu, J. F. Liu**
“Sintered magnets of HDDR Nd-Fe-B powders with artificial R-Cu grain boundary phases”..... 346
 Electron Energy Corporation, Landisville, PA USA
- BP19 - E. Niu,^{1,2} Z.A. Chen¹ G.A. Chen,^{1,3} Y.G. Zhao,^{1,3} J. Zhang,^{1,3} X.L. Rao¹ B.P. Hu¹**
 and Z.X. Wang^{1,2}
“The mechanism of coercivity in sintered R-Fe-B magnets based on misch-metal” 349
¹ Beijing Zhong Ke San Huan Research, Beijing China
² Institute of Physics, Chinese Academy of Sciences, Beijing China
³ Sanvac (Beijing) Magnetics Co., Ltd., Beijing China
- BP20 - Kristina Žagar, Sašo Šturm, Paul McGuinness, Spomenka Kobe**
“Core-shell microstructure of RE-Fe-B grains to achieve maximum coercivity: HRTEM investigations”
 Jozef Stefan Institute

Posters B – Theory – Micromagnetics

BP21 - Alexander Edström, Erna Delczeg-Czirjak, Mirosław Werwinski, Jan Ruzs, and Olle Eriksson

“Stable tetragonal distortions and significantly increased magnetocrystalline anisotropies in FeCo alloys with C or B doping”

Department of Physics and Astronomy, Uppsala University, Uppsala, Sweden

BP22 - Marcos Flavio de Campos¹, Daniel Rodrigues¹, Jose Adilson de Castro¹

“On the suitability of micromagnetics for phases with high magnetocrystalline anisotropy”

UFF – Universidade Federal Fluminense – Volta Redonda RJ BRAZIL

BP23 - Jamileh Beik Mohammadi^{1,2}, Andrew Tuggle^{1,2}, Claudia K.A. Mewes^{1,2}, Tim Mewes^{1,2}, Takao Suzuki^{1,3}

“Micromagnetic Simulations to Optimize the Energy Product of Hard/Soft Nanocomposites”

¹ Center for Materials for Information Technology, University of Alabama, Tuscaloosa

² Department of Physics and Astronomy, University of Alabama, Tuscaloosa

³ Electrical & Computer Engineering, Metallurgical and Materials Engineering, University of Alabama, Tuscaloosa

BP24 - P. Kharel¹, R. Skomski,² P. Manchanda,² Y. Huh,¹ A. Nelson,¹ V. R. Shah,² G. C. Hadjipanayis,³ and D. J. Sellmyer²

“Anisotropy and Micromagnetism of Heusler Alloys”

¹ Department of Physics, South Dakota State University, Brookings, SD USA

² Department of Physics & Astronomy and NCMN, University of Nebraska, Lincoln, NE USA

³ Department of Physics and Astronomy, University of Delaware, Newark, DE USA

BP25 - Marcos Flavio de Campos¹, Fernanda A. Sampaio da Silva¹, Daniel Rodrigues¹, Jose Adilson de Castro¹, Sergio A. Romero², Suzilene Real Janasi³

“Applicability of the SW-CLC Model”

¹ UFF – Universidade Federal Fluminense – Volta Redonda RJ BRAZIL

² IFUSP – Universidade de São Paulo – São Paulo SP BRAZIL

³ BRATS - Cajamar SP BRAZIL

Posters B – Novel Synthesis and Processing

BP26 - M.Farr, A.Campbell, I.R.Harris, A.Bradshaw, R.S. Sheridan, V.S. Mann and **A.Walton^a**

“The effect of Ni impurities on HDDR processing of scrap sintered NdFeB magnets” 352

School of Metallurgy and Materials, University of Birmingham, Edgbaston, Birmingham, UK

BP27 - R.S. Sheridan, V.S.J. Mann, A. Bradshaw, I.R. Harris, and **A. Walton**

“The development of microstructure during HDDR treatment of sintered NdFeB-type magnets” 355

School of Metallurgy and Materials, University of Birmingham, Edgbaston, Birmingham, UK

BP28 - Jose Adilson de Castro¹, **Daniel Rodrigues¹**, Marcos Flavio de Campos¹

“From Neodymium oxide to NdFeB Alloy: An overview on the reduction methods” 358

¹) PUVR– Federal Fluminense University, Volta Redonda, Rio de Janeiro, Brazil

²) BRATS - Sintered Filters and Metallic Powders, Cajamar, São Paulo, Brazil

BP29 - Rikio Soda*, Misaho Akada**, Kenta Takagi*, Kimihiro Ozaki*

“Development of particle-Based Simulation for magnetic-aligned compaction process” 361

*) National Institute of Advanced Industrial Science and Technology (AIST)

**) Technology Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM)

BP30 - O.A. Golovnia¹, A.G Popov¹, A.N. Sobolev², G.C. Hadjipanayis³
*"SIMULATION OF THE MAGNETIC ALIGNMENT OF UNIAXIAL MAGNETIC POWDERS
IN PLP TECHNOLOGY"* 364

¹Institute of Metal Physics, Russia, 620990

²FSBEI HPO «SUSU», Russia, 454080

³Department of Physics and Astronomy, University of Delaware, Newark, DE USA

BP31 - Yikun Fang, Zhiying Liu, Wei Sun, Hongsheng Chen, Minggang Zhu, Wei Li
*"CFD simulation of flow dynamics of fluidized bed jet mills used for rare-earth permanent
magnet powders"*

Division of Functional Materials Research, Central Iron and Steel Research Institute, Haidian, Beijing China

BP32 - G.S. Burkhanov¹, A.A. Lukin², N.B. Kolchugina¹, Yu.S. Koshkid'ko³,
A.G. Dormidontov², K. Skotnicová³, O. Životský³, T. Čegan³, V.V. Sitnov²
*"Effect of Low-Temperature Annealing on the Structure and Hysteretic Properties of
Nd-Fe-B Magnets Prepared with Hydride-Containing Powder Mixtures"* 367

¹Baikov Institute of Metallurgy and Materials Science, Russian Academy of Sciences,
Leninskii pr., 49, Moscow, Russia

²"JSC SPETSMAGNIT", Dmitrovskoe sh. 58, Moscow, Russia

³Vysoka Skola banska - Technical University of Ostrava, 70833, Czech Republic,
Ostrava-Poruba

BP33 - W.Kaszuwar¹, T.Giżyński¹, M.Leonowicz¹, M.Kulczyk², P.Pawlik³
"Cold Hydrostatic Extrusion of Nd-Fe-B Powder" 370

¹Warsaw University of Technology, Faculty of Materials Science and Engineering,
Woloska Warsaw, Poland

²Institute of High Pressure Physics, Polish Academy of Sciences, Warsaw, Poland

³Czestochowa University of Technology, Faculty of Materials Processing Technology and
Applied Physics, Czestochowa, Poland

BP34 - Haibo Feng*, Anhua Li, Shulin Huang, Yanfeng Li, Minggang Zhu, Wexing Xia,
Wei Li
"Coercivity Enhancement of the Sintered Magnets with Blending Magnetic Grains" 373

Division of Functional Materials, Central Iron & Steel Research Institute, China Iron and Steel Research Institute Group,
Beijing 100081 China

BP35 - N.V. Rama Rao, G.C. Hadjipanayis
"Hot deformed Pr-Fe-Cu(Ga)-B magnets with MgGa additive"
Department of Physics and Astronomy, University of Delaware, Newark, DE USA

BP36 - M. Parans Paranthaman¹, Huseyin Ucar¹, David S. Parker¹, M. A. McGuire¹, Brian C. Sales¹,
Cajetan I Nlebedim² and R. W. McCallum²
"Selective Surface Modification of Nd₂Fe₁₄B Permanent Magnets"

¹Oak Ridge National Laboratory, Oak Ridge, TN USA

²Ames Laboratory, Ames, IA USA



**The 23rd International Workshop on
Rare Earth and Future Permanent Magnets and Their Applications
(REPM2014)
Annapolis, Maryland USA - August 17-21, 2014**

**SCHEDULE
THURSDAY, AUGUST 21, 2014**

8:00 – 10:30 AM Worldwide Consortia on Permanent Magnets

8:00 – 8:22 AM – **Satoshi Hirosawa**

“Elements Strategy toward High-Performance Permanent Magnets free from Critical Elements” 375
Director, Elements Strategy initiative Center for magnetic Materials, National Institute for Materials Science, Tsukuba Japan

8:22 – 8:44 AM – **J Cui¹**, J P Choi¹, G Li¹, E Polikarpov¹, M Bowden², M J Kramer³,
M Marinescu⁴, S Ren⁵, and J P Liu⁶

“Development of MnBi Based Permanent Magnet: Powder Synthesis and Bulk Fabrication” 380

¹Pacific Northwest National Laboratory, Richland, WA USA

²Environmental Molecular Sciences Laboratory, Richland, WA USA

³Ames Laboratory/U.S. Department of Energy, Ames, IA USA

⁴Electron Energy Corporation, Landisville, PA USA

⁵University of Kansas, Lawrence, KS USA

⁶University of Texas at Arlington, TX USA

8:44 – 9:06 AM – **Francis Johnson**, Min Zou, Wanming Zhang, Mohammed Haouaoui

“Exchange-Coupled Nanocomposite Permanent Magnets Using a Bottom-up Approach” 384
Ceramic and Metallurgy Technologies, GE Global Research, Niskayuna, NY USA

9:06 – 9:28 AM – G. Giannopoulos¹, C. Sarafidis¹, M. Gjoka¹, L. Reichel^{2,3}, A. Markou¹,
W. Wallisch⁴, V. Psycharis¹, J. Fidler⁴ and **D. Niarchos¹**

“Rare Earth Free Permanent Magnets” 388b

¹INN, NCSR Demokritos, Athens Greece

²IFW Dresden, Dresden, Germany

³TU Dresden, Institute for Materials Science, Dresden, Germany

⁴Vienna University of Technology, Institute Solid State Physics, Vienna, Austria

9:28 – 9:50 AM – **Spomenka Kobe** & ROMEO Consortium

“Replacement and Original Magnet Engineering Options – ROMEO - a European concerted effort”

9:50 – 10:12 AM – **Takao Suzuki^a**, Toshiya Hozumi^{a, b}, Siqian Zhao^a, Patrick LeClair^a
and Gary Mankey^a

“Rare-Earth Free High Magnetic Anisotropy Materials -Temperature Dependence of Magnetic Anisotropy” 393
“G8 Initiative” High Performance Permanent Magnets sustainable for Next Generation”

^aCenter for Materials for Information Technology (MINT) The University of Alabama, Tuscaloosa, AL USA

^bAdvanced Technology Development Center, TDK Corporation, Narita, Japan

10:12 – 10:34 AM – **A. Bollero**
*“NANOPYME Project: In the Search of improved Rare Earth-Free
 Permanent Magnets”* 398
 IMDEA Nanoscience, Madrid, Spain

COFFEE BREAK – 15 MINUTES

10:45 – 12:30 PM – Nanocrystalline Magnets

10:45 – 10:57 AM – **K.A. Gschneidner, Jr.**,^a R.W. McCallum^a, M. Khan^b, A.K. Pathak,
 V.K. Pecharsky^a, L. Zhou, K. Sun, K.W. Dennis, M.K. Kramer, D. Brown^c, and C. Zhou^d
“Dy-free, Reduced Nd, High Performance Nd₂Fe₁₄B-based Permanent Magnets”
 403

The Ames Laboratory, Iowa State University, Ames, IA USA

^aAlso Department of Materials Science and Engineering

^bPresent address: Department of Physics, Miami University, Oxford, OH USA

^cMolycorp Magnequench, Magnequench Technology Center, Singapore

^dMEDA Engineering and Technical Services, Southfield, MI USA

10:57 – 11:09 AM – **H. Sepehri-Amin**¹, T. Ohkubo¹, K. Hono¹, K. Güth², and O. Gutfleisch^{2,3}
*“Anisotropy inducement mechanism in hydrogen disproportionation desorption
 recombination processed Nd-Fe-B powders”* 406b

¹Elements Strategy Initiative Center for Magnetic Materials, NIMS, Tsukuba, Japan

²Fraunhofer ISC Projektgruppe IWKS, Germany

³Materialwissenschaft, Technische Universität Darmstadt, Germany

11:09 – 11:21 AM – **Min Zou**, Wanming Zhang, Christina H. Chen*, Jae-Hyuk Her,
 and Francis Johnson
“SmCo-based Dual-phase Nanocomposite Bulk Permanent Magnets” 409

GE Global Research Center, Niskayuna, NY USA

11:21 – 11:33 AM - **D.S. Neznakhin**^{1*}, A.S. Volegov¹, P.E. Markin^{1,2}, S.V. Andreev¹,
 A.S. Bolyachkin¹, N.V. Kudrevatykh¹
“Low Temperatures Magnetization Reversal Process in Nd-Fe-B Nanostructured Alloys” 412

¹Ural Federal University, Ekaterinburg, Russia

²Institute of Metal Physics UB RAS, Ekaterinburg, Russia

11:33 – 11:45 AM – S. Mican¹, R. Hirian¹, O. Isnard³, I. Chicinaş⁴, **V. Pop**^{1*}
*“Effect of Milling and Annealing Conditions on the Interphase Exchange
 Coupling of Nd₂Fe₁₄B/α-Fe Magnetic Nanocomposites”*
 415

¹Faculty of Physics, Babeş-Bolyai University, 400084 Cluj-Napoca, Romania

²Institut Néel, CNRS, Université Grenoble Alpes, BP 166X, 38042 Grenoble, Cédex 9, France

³CNRS, Institut Néel, Grenoble, F 38042, France

⁴Materials Sciences and Engineering Dept., Technical University of Cluj-Napoca, Cluj-Napoca, Romania

11:45 - 11:57 AM – E. Anagnostopoulou¹, B. Grindi¹, M. Pousthomis¹, L.-M. Lacroix,¹
 F. Ott,² **G. Viau**¹
“From high aspect ratio nanoparticles synthesis to nano-structured permanent magnets” 418

¹Université de Toulouse, LPCNO, UMR 5215 INSA-CNRS-UPS, Toulouse, France

²Lab. Léon Brillouin UMR 12 CEA/CNRS Centre d'Etudes de Saclay France

11:57 – 12:09 PM – **S. Prakash Narayan**¹, Takashi Yanai² and Hirotohi Fukunaga²
“Texture development in Nanocomposite Nd-Fe-B/aFe Rare Earth Magnets” 421

¹Mansarovar Institute of Science & Technology (MIST), India

²School of Engineering, Nagasaki University, Nagasaki, Japan

12:09 – 12:21 PM – **Tetsuji Saito**¹, **Seiichi Saito**¹, and Daisuke Nishio-Hamane²
“Magnetic properties of Sm₅Fe₁₇ melt-spun ribbons and their nitrides”
424

¹ Department of Mechanical Science and Engineering, Chiba Institute of Technology,
Narashino, Chiba, Japan

² Institute for Solid State Physics, The University of Tokyo, Kashiwa, Chiba, Japan

12:21 – 12:33 PM - **Frederick E. Pinkerton**,¹ Jan F. Herbst,¹ Martin S. Meyer¹ Daad Haddad,¹
Chen Zhou,² and Eric Poirier²
“Exploring New Ce-Fe-Based Permanent Magnet Materials” 427

¹General Motors Research and Development Center

²MEDA Engineering and Technical Services, LLC

12:30 – 2:00 PM – LUNCHEON

2:00 – 4:00 PM Hard Magnetic Particles

2:00 – 2:22 PM – **Balamurugan Balasubramanian**, Bhaskar Das, Pinaki Mukherjee,
and David J. Sellmyer
“Development of Nanoparticle- Based Permanent-Magnet Materials: Challenges
and Advances” 429
Nebraska Center for Materials and Nanoscience & Department of Physics and Astronomy, University of
Nebraska, Lincoln, NE USA

2:22 – 2:44 PM – **N. Poudyal**, K. Elkins, K. Gandha and J.P. Liu
“Synthesis and Processing of Hard Magnetic Nanoparticles” 433
Department of Physics, University of Texas at Arlington, Arlington, TX USA

2:44 – 3:06 PM - **A.M. Gabay**, G.C. Hadjipanayis
“Submicron Rare Earth-Cobalt Particles with Improved Hard Magnetic Properties” 437
Physics and Astronomy, University of Delaware, Newark, DE USA

3:06 – 3:28 PM – **M. Yue**^{*a)}, Y. Q. Li^{a)}, Q. Wu^{a)}, W. Q. Liu^{a)}, D. T. Zhang^{a)}, M. L. Xu^{a)},
Z. H. Guo^{b)}, and W. Li^{a)}
“Magnetic Hardening Mechanism of Hard Magnetic Nanoparticles Prepared by
Surfactant-Assisted Ball Milling”458
^aCollege of Materials Science and Engineering, Beijing University of Technology, Beijing, China
^bDivision of Functional Materials, Central Iron and Steel Research Institute, Beijing, China

3:28 – 3:50 PM – **Yingchang Yang**
“Submicron Sm-Fe-N Magnet Powders with High Coercivity” 442
Peking University, Beijing China

3:50 – 4:02 PM – **Bovda O. M.**¹, Bovda V. O.¹, Onischenko L.V.¹, Shykhailo P.M.²,
Ostrovskii I. M.²
“Nd-Fe-B nanoparticles prepared by cryomilling”
¹National Scientific Center, Kharkiv Institute of Physics and Technology (NSC KIPT), Ukraine
²Polus-N LLC, Ukraine

COFFEE BREAK – 15 MINUTES

4:15 – 6:30 PM SYMPOSIUM – SEARCH FOR NEW HARD MAGNETIC MATERIALS

4:15 – 4:37 PM - **C. Z. Wang**^{1,2}, X. Zhao^{1,2}, M. C. Nguyen^{1,2}, L. Q. Ke¹, W. Y. Zhang³,
M. J. Kramer^{1,4}, D. J. Sellmyer³, X. Z. Li³, V. P. Antropov¹, F. Zhang¹, and K. M. Ho^{1,2}
*“Predicting the Crystal Structures of Magnet Materials Using Adaptive
Genetic Algorithm”* 446

¹Ames Laboratory – US Department of Energy, Ames, IA USA

²Department of Physics and Astronomy, Iowa State University, Ames, Iowa, 50011, USA

³Nebraska Center for Materials and Nanoscience and Department of Physics and Astronomy, University of Nebraska,
Lincoln, NE

⁴Department of Materials Science and Engineering, Iowa State University, Ames, IA USA

4:37 – 4:59 PM - **Claudia Felser**, Rolf STINSHOF, Stanislaw CHADOV, Guido KREINER,
Ajaya K. NAYAK

“Tetragonal Heusler Compounds for Permanent Magnets”

Max Planck Institute of Chemical Physics for Solids, Dresden, 01187 Dresden, Germany

4:59 – 5:21 PM - **Duane D. Johnson**,^{1,2} Aftab Alam,³ Arjun Pathak,¹ V. Pecharsky,^{1,2}
Karl Gschneidner, Jr.,^{1,2} and R.W. McCallum^{1,2}
*“Better (non)Rare-Earth Magnets – Using DFT as a Computational Design Tool
for Replacing Critical Materials”* 450

¹Division of Materials Science & Engineering, Ames Laboratory, 311 TASF, Iowa State University, Ames, IA USA

²Department of Materials Science & Engineering, Iowa State University, Ames, IA USA

³Department of Physics, Indian Institute of Technology, Bombay, Powai, Mumbai, India

5:21 – 5:43 PM – **Biplab Sanyal**

“Realizing high moment materials by combining rare earth and transition metals”

Department of Physics and Astronomy, Division of Materials Theory, Angstromlaboratoriet, Uppsala University,
Uppsala, SWEDEN

5:43 – 6:05 PM - **D. Goll**, J. Herbst, R. Karimi, R. Loeffler, , U. Pflanz, R. Stein,
G. Schneider

*“New Rare Earth Lean Permanent Magnets by the Application of
High-Throughput Methods”* 454

Aalen University, Materials Research Institute, Beethovenstr. 1, Aalen, Germany

6:05 – 6:27 PM - **Ichiro Takeuchi**

“Combinatorial Investigation of New Permanent Magnet Materials”

Department of Materials Science and Engineering, University of MD, College Park, MD USA

6:30 – 6:45 PM – CLOSING REMARKS