

7th International Topical Meeting on Neutron Radiography 2012

(ITMNR-7)

Physics Procedia Volume 43

**Kingston, Canada
16 – 24 June 2012**

Editors:

P. C. Hungler

ISBN: 978-1-62748-759-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com



The Neutron's Discovery – 80 Years on

J.D. Rogers	1
A Review of Significant Advances in Neutron Imaging from Conception to the Present J.S. Brenizer	10
The Development of Neutron Radiography and Tomography on a SLOWPOKE-2 Reactor L.G.I. Bennett, W.J. Lewis, P.C. Hungler	21
Scientific Design of the New Neutron Radiography Facility (SANRAD) at SAFARI-1 for South Africa F.C. de Beer, F. Gruenauer, J.M. Radebe, T. Modise, B. Schillinger	34
Current Activities of Neutron Imaging Facilities in KUR (Kyoto University Research Reactor) Y. Kawabata, Y. Saito	42
Design of Real-time Neutron Radiography at China Advanced Research Reactor L. He, S. Han, H. Wang, L. Hao, M. Wu, G. Wei, Y. Wang, Y. Liu, K. Sun, D. Chen	48
A Low-cost Neutron Radiography Device D. Turkoglu, L. Cao, R. Lewandowski	54
Preliminary Experiments of Neutron Radiography with Several Hundred keV Fast Neutrons H. Li, Y. Zou, S. Wang, W. Wen, S. Liu, G. Tang, Y. Lu, Z. Guo	66
Design of Cold Neutron Imaging Facility at China Advanced Research Reactor S. Han, M. Wu, H. Wang, L. Hao, G. Wei, L. He, Y. Wang, Y. Liu, D. Chen	73
Progress of PKUNIFTY – A RFQ Accelerator based Neutron Imaging Facility at Peking University Z. Guo, Y. Lu, Y. Zou, K. Zhu, S. Peng, J. Zhao, S. Gao, W. Wen, H. Li, Q. Zhou, H. Ren, P. Lü, H. Zeng, S. Wang, G. Tang, D. Mo, Z. Yuan, D. Xie, X. Yan, J. Chen	79
Studies on a Pulsed Thermal/Epithermal Neutron Source with a Compact Accelerator for Neutron Imaging H. Hasemi, T. Kamiyama, Y. Kiyanagi	86
Present Status of Research on Pulsed Neutron Imaging in Japan Y. Kiyanagi, T. Shinohara, T. Kai, T. Kamiyama, H. Sato, K. Kino, K. Aizawa, M. Arai, M. Harada, K. Sakai, K. Oikawa, M. Ooi, F. Maekawa, H. Iikura, T. Sakai, M. Matsubayashi, M. Segawa, M. Kureta	92
IMAT – A New Imaging and Diffraction Instrument at ISIS W. Kockelmann, S.Y. Zhang, J.F. Kelleher, J.B. Nightingale, G. Burca, J.A. James	100
Visibility Estimation for Neutron Resonance Absorption Radiography using a Pulsed Neutron Source T. Kai, F. Maekawa, H. Oshita, H. Sato, T. Shinohara, M. Ooi, M. Harada, S. Uno, T. Otomo, T. Kamiyama, Y. Kiyanagi	111
Spectral Characterization of a Velocity Selector Type Monochromator for Energy-Selective Neutron Imaging S. Peetersmans, F. Grazzi, F. Salvemini, E. Lehmann	121
Verifying Neutron Tomography Performance using Test Objects A.P. Kaestner, E.H. Lehmann, J. Hovind, M.J. Radebe, F.C. de Beer, C.M. Sim	128
Evaluation Procedures for Spatial Resolution and Contrast Standards for Neutron Tomography M.J. Radebe, F.C. de Beer, A. Kaestner, E. Lehmann, C.M. Sim, E. Sideras-Haddad	138
Edge Enhancement in Cold Neutron Imaging: A Comparison of Experiments at Edges and Interfaces with Ray-tracing based on Refraction and Reflection L.G. Butler, E.H. Lehmann	149
Investigation of the Brightness Enhancement using Brightness Enhancement Films on a Scintillator H. Iikura, N. Tsutsui, Y. Saito, T. Nojima, R. Yasuda, T. Sakai, M. Matsubayashi	161
Comparison of Image Filters for Low Dose Neutron Imaging P.C. Hungler, L.G.I. Bennett, W.J. Lewis, G. Bevan, J. Metzler	169
A Double Detector Set-up for Simultaneous Transmission and Diffraction Neutron Imaging S. Peetersmans, E.H. Lehmann	179
Upgrade of Bragg Edge Analysis Techniques of the RITS Code for Crystalline Structural Information Imaging H. Sato, T. Shinohara, R. Kiyanagi, K. Aizawa, M. Ooi, M. Harada, K. Oikawa, F. Maekawa, K. Iwase, T. Kamiyama, Y. Kiyanagi	186
A Line Pair Indicator Made of Gd Film for Evaluating Spatial Resolution R. Yasuda, M. Matsubayashi, T. Sakai, T. Nojima, H. Iikura, M. Katagiri, K. Takano, P. Tatiana, A. Faenov	196
The Study of Zinc Sulphide Scintillator for Fast Neutron Radiography W. Yang, T. Bin, H. Heyong, L. Bin, T. Ke, S. Yong, Y. Wei, C. Chao	205
New Type of Neutron Image Scintillator based on $H_3^{10}BO_3/ZnS(Ag)$ Y. Wang, S. Han, L. Hao, L. He, G. Wei, M. Wu, H. Wang, Y. Liu, D. Chen	216
Development of a High-performance Optical System and Fluorescent Converters for High-resolution Neutron Imaging T. Sakai, R. Yasuda, H. Iikura, T. Nojima, M. Matsubayashi	223

Progress in Industrial Applications using Modern Neutron Imaging Techniques C. Grünzweig, D. Mannes, A. Kaestner, F. Schmid, P. Vontobel, J. Hovind, S. Hartmann, S. Peetermans, E. Lehmann	231
Imaging of Quantum Mechanical Effects in Superconductors by Means of Polarized Neutron Radiography W. Treimer, O. Ebrahimi, N. Karakas	243
Study on the Properties of Supercritical Water Flowing in a Closed Loop using Dynamic Neutron Radiography M. Balaskó, L. Horváth, Á. Horváth, A. Kiss, A. Aszódi	254
Application of Neutron Radiography to Flow Visualization in Supercritical Water N. Takenaka, K. Sugimoto, S. Takami, K. Sugioka, T. Tsukada, T. Adschari, Y. Saito	264
Pseudo Dynamic Visualization of Boiling Two-phase Flow under Oscillatory Flow Condition H. Umekawa, T. Ami, S. Fujiyoshi, Y. Saito	269
Visualization of Water Behavior in the in-plane and through-plane Directions in a PEFC using a Neutron Image Intensifier H. Murakawa, K. Sugimoto, K. Miyata, H. Asano, N. Takenaka, Y. Saito	277
Development of an Imaging System for the Observation of Water Behavior in a Channel in PEMFC T. Nojima, R. Yasuda, N. Takenaka, M. Katagiri, H. Iikura, T. Sakai, M. Matsubayashi	282
Measurement of Water Distribution in through-plane Direction in a PEFC using a Neutron Image Intensifier K. Sugimoto, H. Murakawa, K. Miyata, H. Asano, N. Takenaka, R. Yasuda	288
Neutron Radiography and Tomography Investigations of the Secondary Hydriding of Zircaloy-4 during Simulated Loss of Coolant Nuclear Accidents M.K. Grosse, J. Stuckert, M. Steinbrück, A.P. Kaestner, S. Hartmann	294
Design of the Testing Set-up for a Nuclear Fuel Rod by Neutron Radiography at CARR G. Wei, S. Han, H. Wang, L. Hao, M. Wu, L. He, Y. Wang, Y. Liu, K. Sun, D. Chen	307
Quantitative Measurement of Element Distributions using the Neutron-transmission Resonance-absorption Method M. Harada, J.D. Parker, T. Sawano, H. Kubo, T. Tanimori, T. Shinohara, F. Maekawa, K. Sakai	314
Neutron Imaging of Alkali Metal Heat Pipes K. Kihm, E. Kirchoff, M. Golden, J. Rosenfeld, S. Rawal, D. Pratt, A. Swanson, H. Bilheux, L. Walker, S. Voisin, D.S. Hussey, D.L. Jacobson	323
Neutron Radiography, Tomography, and Diffraction of Commercial Lithium-ion Polymer Batteries L.G. Butler, E.H. Lehmann, B. Schillinger	331
Neutron Resonance Imaging of a Au-In-Cd Alloy for the JSNS M. Ooi, M. Teshigawara, T. Kai, M. Harada, F. Maekawa, M. Futakawa, E. Hashimoto, M. Segawa, M. Kureta, A. Tremsin, T. Kamiyama, Y. Kiyanagi	337
Neutron Imaging of Archaeological Bronzes at the Oak Ridge National Laboratory K. Ryzewski, S. Herringer, H. Bilheux, L. Walker, B. Sheldon, S. Voisin, J.-C. Bilheux, V. Finocchiaro	343
Attempts for Simultaneous Observation of Image and Elemental Component in a Pottery Sample using Neutrons S. Sekimoto, Y. Saito, D. Ito, Y. Homura, M. Ebihara, Y. Kawabata	352
Analysis of Crystallographic Structure of a Japanese Sword by the Pulsed Neutron Transmission Method K. Kino, N. Ayukawa, Y. Kiyanagi, T. Uchida, S. Uno, F. Grazzi, A. Scherillo	360