PS01.09.08 A NEW POWDER NEUTRON DIFFRACTOMETER AT THE JEEP II REACTOR AT KJELLER IN NORWAY. Bjorn C. Hauback, Helmer Fjellvaag and Olav Steinsvoll, Department of Physics, Institute for Energy Technology, P.O. Box 40, N-2007 Kjeller, Norway

A new high-resolution powder neutron diffractometer has been installed at the 2 MW JEEP II reactor at Institute for Energy Technology. Special emphasis has been put on designing a flexible instrument where the utilization of useful neutrons is maximized. At a low-flux reactor, like JEEP II, great efforts are required to optimize the relationship between intensity (signal/noise ratio) and resolution. In that respect, the most important components of the diffractometer system are the collimators, the monochromator, the detector and the shielding. A new in-pile collimator with increased height has been installed. Different Soller slit collimators in the incident neutron beam allow either a high intensity or a high resolution mode. The flux at the sample position is enhanced by using a vertically focussing composite germanium monochromator. Wavelengths in the range 0.7 - 2.6 Å are available by using different reflections from Ge (h11), h=3,5,7 and by varying the monochromator take-off angle in the range 55-100 degrees. Each of the two detector-units, containing seven position sensitive He-3 detectors stacked on top of each other, covers 20 degrees in 2theta. A complete powder pattern of 120 degrees can be collected by moving both detector-units together in three steps. All parts of the instrument is controlled by software running on a PC-486 computer using the OS-9000 operative system. A HP work-station is connected to the instrument with graphics and programs for data treatment, Rietveld refinements and general crystallographic calculations. Examples of possible applications of the new powder neutron diffractometer will be shown.

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PS01.09.09 TWO NEW TOF NEUTRON POWDER DIFFRACTOMETERS AT KENS. T. Kamiyama and K. Oikawa, Institute of Materials Science, University of Tsukuba, Tennodai, Tsukuba, Ibaraki 305, Japan, M. Furusaka and S. Satoh, National Laboratory for High Energy Physics, Tsukuba, Ibaraki 305, Japan, F. Izumi, National Institute for Research in Inorganic Materials, 1-1 Namiki, Tsukuba, Ibaraki 305, Japan

A time-of-flight (TOF) neutron powder diffractometer, VEGA, has been operating at KENS since November, 1993. VEGA is situated 19 m apart from a solid-methane moderator at 30 K. Though upgrades of their hardware and software are ongoing, VEGA has already demonstrated itself as a better successor of the previous powder diffractometer HRP in both resolution and intensity.

VEGA has backscattering, 90 degree, and low-angle banks; each bank contains arrays of one-dimensional 3He position-sensitive detectors (PSD's) to cover wide solid angles two-dimensionally. Such a unique design was adopted because any arrangement with many short and long normal detectors along Debye-Scherrer rings inevitably produces wide inactive regions. Two-dimensional PSD's were not used because of their lower counting-rate limitations and difficulty in maintenance. This new geometry makes it possible to increase the efficiency of data collection and to improve resolution. The backscattering bank covers a solid angle of 1.2 str (0.9 str at present) with a resolution of delta(d)/d = 0.002. The typical measurement time with this bank for the Rietveld analysis is 4 h, which is four times as short as that with HRP. The 90 degree bank is suitable for in situ experiments under special environments such as high pressure and high temperature. The low-angle bank is utilized to cover long d ranges. Results of some Rietveld refinements with RIETAN96T developed recently will be presented.

Further, another TOF neutron powder diffractometer with higher resolution is now under construction at KENS. The incident flight path for this diffractometer is about 40 m. It has a backscattering bank with 500 one-dimensional PSD's, which are 2 m apart from a sample position. The designed resolution is as high as 0.0009.

PS01.09.10 CHARACTERISTIC AND OPTIMIZATION OF AN IMAGING PLATE NEUTRON DETECTOR. Karasawa Y., Niimura N., Yamada T., Moriai A., Takahashi K(1)., Tazaki S(1)., Miyahara J(1) Japan Atomic Energy Research Institute, Tokai, Ibaraki, 319-11, Japan, (1)Fuji Photo Film Co., Ltd. Kanagawa, 258 Japan

The properties of imaging plate neutron detectors (IP-ND) were investigated by varying the molar ratio of neutron converter materials to a photostimulated luminescence materials (PSL) and IP-ND thickness in the wide range and systematically, and optimization of IP-ND was discussed by considering the basic processes occurring in the IP-ND. We have already developed and reported the IP-ND where the neutron converters, 6LI or Gd were mixed with PSL materials on a flexible plastic support. The dynamic range and spatial resolution of our IP-ND were obtained as 1:105 and less than 0.2 mm, respectively and the neutron detection efficiency of some IP-ND reached about 80 % at neutron wavelength (Niimura, Karasawa, Tana ka, Miyahara, Thakahashi, Saito, Koizumi & Hidaka, Nucl. Instrum. & Methods A349(1994) 521). These distinctive features are more revolutionary and excellent than any other neutron detectors existing so far and must be applicable for many fields of neutron beam experiments. The properties of the IP-ND depend on the kind of the neutron converter, the molar ratio of neutron converter to PSL materials, thickness of the IP-ND and so on and the optimization was treated by considering three processes occurring in the IP-ND. Those are (1) neutrons are captured by neutron converters and they emit secondary charged particles.(2)which create color centers. (3)In read out procedure, both incident and PSL lights absorb themselves in the IP-ND.

The applications of the IP-ND to several experiments such as neutron crystallography in biology, radiography, powder diffractometer, small angle thermal neutron scattering and so on have been demonstrated and the excellent results have been given. The neutron diffractometer equipped with the optimized IP-ND dedicated for bio-macromolecules has been constructed in JRR-3M in Japan Atomic Energy Research Institute. Data acquisition speed of the diffractometer has increased more than 10 times than the one of the normal position sensitive gas filled detector.