perfect silicon Si(111) and natural green mica: Mica(006) at near back scattering condition; 2qB ~ 160. deg. using the diffraction counter bank on LAM-80: the indirect geometry crystal analyzer time of flight (TOF) spectrometer installed at KENS; a pulsed neutron source in KEK, Japan. At several offset angles from some Bragg conditions, we observed clear TDS peaks due to some acoustic phonon branches in the time of flight (TOF) diffraction spectrum.

Keywords: thermal diffuse scattering, time-of-flight diffraction, pulsed neutron scattering

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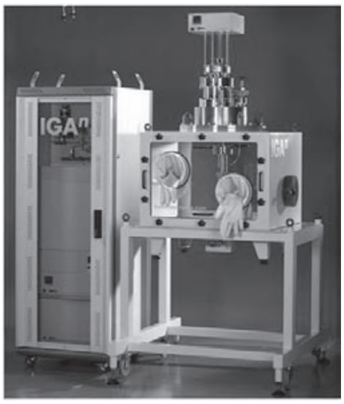
### Simultaneous thermogravimetric and neutron diffraction characterization of hydrogen stores

Martin M Jones[1], William I. F. David[1,2], Marco Sommariva[2], Peter P Edwards[1]
[1]University of Oxford, Inorganic Chemistry Laboratory, South Parks Road, Oxford, Oxon, OX1 3QR, UK, [2]ISIS Facility, Rutherford Appleton Laboratory, Chilton, Oxon, OX11 0QX, UK, E-mail：martin.jones@chem.ox.ac.uk

We have developed apparatus that allows us to perform simultaneous thermogravimetric and neutron diffraction measurements on the GEM and HRPD diffractometers at ISIS as a function temperature, pressure and/or time. This apparatus, the Intelligent Gravimetric Analyzer for Neutrons (IGAn), was constructed as a collaborative effort between the Rutherford Appleton Laboratory and the University of Oxford. Dynamic neutron diffraction allows us to follow the transformation of materials on hydrogenation and dehydrogenation. Simultaneous thermogravimetric measurements permit these transformations to be correlated to the key kinetic and thermodynamic processes. In this way, we can fully characterize the hydrogenation and dehydrogenation profile of hydrogen storage materials and thus obtain a fuller understanding of the critical processes involved. Initial benchmarking experiments on the $Mg/MgD_2$ system have identified the potential of this approach, and we report here the results of deuterium absorption / desorption cycling experiments for the $Li_3N$ - $Li_2ND$ - $LiND_2$ system.



Keywords: neutron diffraction techniques, thermogravimetry, hydride compounds

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### Boost of multiple reflection effects - a new challenge for high-resolution neutron experiments

Pavol Mikula[1], Miroslav Vrana[2], Volker Wagner[3]
[1]Nuclear Physics Institute v. v. i., Academy of Sciences of the Czech Republic, Neutron Physics Department, Husinec-Rez, Rez near Prague, Czech, 25068, Czech Republic, [2]Nuclear Physics Institute v. v. i., Academy of Sciences of the Czech Republic, Rez near Prague,Czech Republic, [3]Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany, E-mail：mikula@ujf.cas.cz

An enormous excitation of the multiple reflection (MR) effects achieved by bending the perfect single crystals is reported. These MR-effects (often called as Renninger effects) can be observed when more than one set of planes are simultaneously operative for a given wavelength i.e. when more than two reciprocal lattice points are at the Ewald sphere. Using a bent perfect crystal, the MR-effect can be considered as a two step process when primary reflection represented by (h1k1l1)-planes is simulated by successive reflections realized on the lattice planes (h2k2l2) and (h3k3l3) which are mutually in dispersive diffraction geometry. The luminosity corresponds to the volume of the phase space element of the monochromatized beam represented by the very narrow wavelength spread and the divergence as well. Therefore, the dispersive double-crystal reflections can provide very high angular and wavelength resolution without use of any collimators with a possible application namely at the high flux neutron sources. In relation to the value of the bending radius, the obtained doubly reflected beam has, a narrow wavelength band-width of $10^{-4}$ -$10^{-3}$ and the collimation of the order of minute of arc. In NPI Rez we are building neutron optical bench employing such dispersive MR-monochromator which will operate at the neutron wavelength lambda of 0.16 nm. The bench could be used e.g. for some neutron optics testing, for investigation of structure quality of real single crystals and high resolution neutron radiography. First preliminary results will be presented.
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Keywords: neutron diffraction, Bragg diffraction optics, multiple reflections

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### Transmission neutron monochromator and coherent neutron scattering images

Masayoshi B. Tamaki
TAMAKI Memorial Institute, Preparatory Room, Kuboshin-machi 2, Komaki, Aichi, 485-0006, Japan, E-mail：a40507a@cc.nagoya-u.ac.jp

Transmission neutron monochromator(TNM) is of a combination of single crystals. Through Bragg-cut-off and anti-Bragg-cut-off filters, a white neutron beam is changed to a narrow-band [1]. To cut off shorter wavelength neutrons, long pass filter is used. It is of a Bragg cut-off wavelength $\lambda_1$. To cut off longer one, short pass filter is used. It is of an anti-Bragg cut-off filter with $\lambda_2$. Here, $\lambda_1<\lambda_2$. The transmitted neutron has spectrum from $\lambda_1$ to $\lambda_2$. Using graphite single crystals, the TNM set-up is shown in a following figure. When a pair of single crystals was set in the white beam by diffraction angles of $\theta+\Delta\theta$ and $\theta-\Delta\theta$, it was changed into spectrum with two depletions. Increasing number of the pairs of single crystals, a sharp peak is remained due to that other wavelengths were diffracted. It is monochromatic. The proposed and prepared TNM, installed together with neutron velocity selector and spectrometer, was successfully verified to be intrinsic function as neutron monochromator. Applications were tested for coherent scattering imagings of anisotropic structure of welded iron, of nickel single crystal, and of neutron polarizer.

[1] M. Tamaki, NIM A 542,32(2005).

Keywords: neutron imaging, transmission monochromator, coherent scattering