

# Autumn School on Application of Neutrons and Synchrotron Radiation in Engineering Materials Science

*T. Wroblewski*

The Virtual Institute 'Photons and Neutrons Research on Advanced Materials' [1] was established as a collaboration of the three Helmholtz research centers DESY, GKSS, and HMI and the universities TU Berlin, TU Clausthal, TU Dresden and TU Wien.

The Large Scale Facilities of the Helmholtz Society offer unique possibilities by complementary use of photons and neutrons for structural analyses of advanced engineering materials. By using photons delivered by a synchrotron radiation source and by using neutrons, information about materials' microstructures can be obtained non-destructively in the near-surface region as well as in the bulk of solid samples. Compared to conventional laboratory X-rays the spatial resolution achievable using synchrotron radiation can be improved by up to several orders of magnitude.

Diffraction methods reveal information about crystalline phase volume fractions, texture and residual stresses, while tomography provides complementary 3-dimensional images of the material's microstructure. Both diffraction and tomography have increasing impact in the fields of design of tailored materials, their processing and lifetime assessment.

The integration of complex experimental techniques and specialized engineering material knowledge requires coordinated R&D actions such as this Virtual Institute to provide system solutions for ever increasing demands in the field of high-performance engineering materials and systems. The combination of different expertises and the demonstration of successful examples are also important for problem and innovation oriented co-operations with industry either bilateral or e.g. in BMBF - and EU-projects by the participation of the partners of this Virtual Institute. In this context, a joint presentation of the Virtual Institute PNAM is planned via seminars, workshops and the internet. The long-term aim of the virtual institute is the establishment of a center of excellence for photon and neutron research on engineering materials as a partner for automotive, energy and manufacturing industries where detailed information on process, microstructure and stress state of the components as well as the micro-mechanism of failure processes at interfaces can be implemented for a better and safer design of advanced components.

One step towards this aim is the establishment of a biannual autumn school on the 'Application of Neutrons and Synchrotron Radiation in Engineering Materials Science' which took first place in Ammersbek near Hamburg from October 10<sup>th</sup> to 14<sup>th</sup> 2005. The covered topics reached from the properties of neutron and synchrotron radiation to those of materials like residual stress texture and how these are influenced by different treatments.

During the second day different imaging and scattering techniques were presented and the application to various problems in engineering materials science was demonstrated.

While the lectures of the first two days were given by speakers related to the virtual institute, the third day was aiming at a broader view with talks from industry and other neutron and synchrotron radiation sources.

The last two days were dedicated to practical training. The 40 participants were split into two groups, alternately visiting DESY and GKSS for hands-on experiments.

A book about the school is planned to appear in autumn 2006, published by Wiley. It is intended to continue the series with an autumn school in Berlin 2007.

## References

- [1] <http://www.tu-berlin.de/~pnam>



Figure 1: Participants and Lecturers of the autumn school in front of “Haus am Schüberg”