Foreword

Neutron and X-Ray Studies of Advanced Materials VIII

The selection of the manuscripts in the special topic "Neutron and X-Ray Studies of Advanced Materials VIII" is based on the material presented during the TMS 2015 Annual Meeting conducted in Orlando, Florida. The aim of the symposium was to provide a forum for discussion of using state-of-the-art neutron and X-ray scattering techniques to probe advanced materials.

The focused set of papers presented below offers a view of the different aspects of the diffraction and scattering techniques in different laboratories in the world.

The first paper by Maser *et al*. from the Argonne National Laboratory, USA, relates to the next-generation hard X-ray nanoprobe beamline such as the in situ nanoprobe beamline being planned at the advanced photon source (APS). The new beamline will combine a very high spatial resolution with high focused flux.

The second manuscript, by Scardi *et al*. from the University of Trento (Italy), relates to a new methodology of the powder diffraction study of nanocrystals. Molecular Dynamics simulations of Pd nano-polycrystalline materials were generated. Using Debye scattering equation, these structure was further used as "experimental" data to test the methods for line-profile analysis. Results show that the Krivoglaz–Wilkens theory of line broadening qualitatively agrees with the modeling results.

The third manuscript by Xiaohua Hu *et al*. describes the results of in situ high-energy X-ray diffraction in comparison with multi-phase elasto-plastic self-consistent model. The authors used the suggested method to characterize the properties of advanced high-strength steels and to determine the constitutive behaviors of various phases by comparing the predicted and measured lattice strain distributions.

The next two papers by Jie Liu *et al*. are focused on the studies of phase transitions in laser beam-welded TiAl-based alloy. They compare the results of the microstructural and the time-resolved high-energy diffraction. For the first time, the authors show that the non-Burgers alpha grains nucleate on the primary borides.

In the next paper, Yuhui Sha *et al*. present the results of the texture and microstructure for magnetic properties of two-stage cold-rolled Fe-6.5 Wt pct Si thin sheets. The authors show that the number and the nature of shear bands being related to the intermediate grain size and rolling parameters are responsible for the recrystallization texture.

In another paper, Sha *et al*. present the study of recrystallization texture transition in Fe-2.1 wt pct Si sheets. They propose the variety of final recrystallization textures for non-oriented silicon steel.

The last paper, by Alain Jacques, is focused on combining the plasticity modeling with the analysis of X-ray three-crystal diffractometer intensity peaks for single-crystal Ni-based superalloys. The author attempts to compare his results of peak simulation with those of the classic peak profile analysis. This interesting approach provides another possibility to study dislocation density formation. It results in a deeper understanding of different peak profile parameters and their relations to real dislocation structure in the materials.

Guest Editor:
R.I. Barabash
Oak Ridge National Laboratory,
Materials Science & Technology Division,
Oak Ridge, TN 37831
rbarabas@utk.edu