

4D Neutron Imaging for Textured Samples

Elewa, Nancy Naguib

Physics Department, Ain Shams University, Egypt

Neutrons are important and powerful tool for studying materials as it is considered to be a unique of probe for important details on the behaviour and structure of different alloys. Neutron imaging has undergone notable advancement in recent years due to the creation of neutron spallation generators that produce beamlines with brighter pulsed neutrons. However, research on crystallographic phase mapping using neutron imaging was limited to the spatial and temporal resolution of the current detectors [1]. Additionally, identification of the crystallographic phases in a textured materials is typically a complex process since the texture influences the thermal neutron cross-section, resulting in a different neutron spectrum compared to an isotropic sample [2–4]. The phase determination was studied using neutron imaging and confirmed with neutron diffraction for a textured sample (Figure 1).

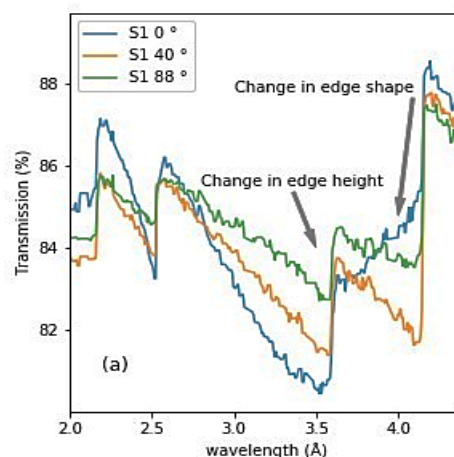


Figure 1. The texture of the sample appears at different rotation angle.

- [1] A. Steuwer, P.J. Withers, J.R. Santisteban, and L. Edwards, “Using pulsed neutron transmission for crystalline phase imaging and analysis,” *J. Appl. Phys.*, vol. 97, no. 7, p. 074903, Apr. 2005, doi: 10.1063/1.1861144.
- [2] R. Woracek, J. Santisteban, A. Fedrigo, and M. Strobl, “Diffraction in neutron imaging—A review,” *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.*, vol. 878, pp. 141–158, 2018, doi: 10.1016/J.NIMA.2017.07.040.
- [3] F. Malamud *et al.*, “Texture analysis with a time-of-flight neutron strain scanner,” *J. Appl. Crystallogr.*, vol. 47, no. 4, pp. 1337–1354, Aug. 2014, doi: 10.1107/S1600576714012710.
- [4] J.R. Santisteban, L. Edwards, and V. Stelmukh, “Characterization of textured materials by TOF transmission,” *Phys. B Condens. Matter*, vol. 385, pp. 636–638, Nov. 2006, doi: 10.1016/j.physb.2006.06.090.