Neutron tomography and diffraction for cultural heritage studies

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Description

The neutron methods are a powerful tool of non-destructive analysis, playing an important part in industrial and scientific research. The fundamental difference in the nature of neutron interaction with matter compared to X-rays provides additional benefits to neutron methods, including sensitivity to light elements, notable difference in contrast between neighboring elements or isotopes, high penetration into metals or heavy elements. All these features make neutron tomography and diffraction highly demanded tools with a growing range of applications in industry, geophysics, paleontology, archeology and other various fields, including cultural heritage investigations. Investigations of cultural heritage by means of modern non-destructive methods are related not only to the experimental recording of internal defects and the detection of corrosion creepage, but also to detailed study of variations in the chemical.

Tasks

- Processing of neutron radiographic images
- Reconstruction of 3D models based on radiographic projections
- Processing and fitting of neutron diffraction spectra
- Preparation of the final report

Required skills

• Condensed matter physics

- General math
- Confident PC user

Acquired skills and experience

- Image preparation
- Algorithms for the reconstruction of 3D models
- 3D data analysis
- Determination of the phase composition from diffraction data
- Interpretation of the results

Recommended literature

- Kozlenko D. P., Kichanov S. E., Lukin E. V., Rutkauskas A. V., Belushkin A. V., Bokuchava G. D., Savenko B. N. Neutron radiography and tomography facility at IBR-2 reactor, Phys. Part. Nuclei Lett., 13: 346 (2016).
- Kardjilov, N.; Giulia, F. Neutron Methods for Archaeology and Cultural Heritage, 1st ed.; Springer International Publishing: Berlin/Heidelberg, Germany, 2017; pp. 3–171.