HOW USEFUL IS NEUTRON DIFFRACTION FOR STUDYING ARCHAEOLOGICAL CERAMICS?

W. Kockelmann

Rutherford Appleton Laboratory, ISIS Facility, Chilton, United Kingdom

Time-of-flight neutron diffraction can be used to non-destructively determine the mineralogical compositions and structural properties of materials [1] such as ceramics, metals objects and pigments. Neutrons interact weakly with matter and penetrate large volumes of material without substantial loss of intensity. Hence, a truly quantitative analysis of the mineral phase contents, crystal structures, textures and strains of intact objects can be achieved, without the need for taking samples. Moreover, the information gained is representative of a large part of the object. In the past few years, there have been a number of neutron diffraction analyses on archaeological ceramics at the ISIS pulsed neutron source at the Rutherford Appleton Laboratory, UK. This paper surveys on the range of materials and objects that can be studied with neutron diffraction, such as pottery fragments, complete museum artefacts, ceramic seals and casting cores hidden inside metal objects. It is now time to take stock of these diverse projects and to summarize advantages and drawbacks for research on archaeological ceramics, to assess the usefulness and problems of the method in terms of information content, analysis of large sample series, and effects of the neutron radiation. A critical assessment of the neutron diffraction method is given, with an outlook of how to better utilize the tool to answer questions of archaeological significance.

[1] W. Kockelmann, A. Kirfel, E. Haehnel, Non-destructive analysis of archaeological ceramics using TOF neutron diffraction, Journal of Archaeological Science 28 (2001) 213-222.