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Neutron radiography for cultural heritage objects in Iran

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A. Movafeghi(1), E. Yahaghi (2), M. H. Choopan-Dastjerdi (1) and B.Rokrok (1)

(1) Nuclear Science and Technology Research Institute, Tehran, Iran

(2) Imam Khomeini International University, Qazvin, Iran

Email addresses: amovafeghi@aeoi.org.ir

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Neutron radiography (NR) is a useful technique in non-destructive testing (NDT) of cultural heritage objects. NR is complementary to X and gamma radiography. A new NR beam line has recently been built at the Tehran Research Reactor (TRR) in order to expand the national applications of NR. The examination and characterization of internal structure and composition can be difficult task, in particular for cultural heritage objects. Conventional Radiography shows only density variations and has some other drawback in archaeological applications, particularly as the more durable metals such as gold, silver and lead are nearly opaque to X-rays. On the other hand, NR is quite sensitive in detection of hydrogenous materials such as water, water-logged ceramics, organic materials such as wood or water-logged wood, plants, seeds, food remnants, leather, textiles, paper, fragrances, tar, epoxy resins etc. With NR, for example, it is possible to visualize hydrogen-containing materials inside metal artefacts much better than with X-rays, whereas the XR technique is more suitable for visualizing the integrity of metal objects or metal parts of objects made of organic materials. In this research, a historical object has been radiographed by means of new neutron beam line of TRR. The object was a vase from Samiran region of Qazvin Province, Iran. The age of the vase has been estimated 900 years old, approximately. The digital neutron radiography technique was used by the digital imaging plates (or Computed Radiography: CR). The image was obtained and saved in digital format. This was the first neutron radiography image of new NR facility at TRR. The results showed that the new system can be used effectively for the neutron radiography of cultural heritage objects.

Primary author: MOVAFEGHI, Amir (Nuclear Science and Technology Research Institute, Tehran, Iran)

Presenter: MOVAFEGHI, Amir (Nuclear Science and Technology Research Institute, Tehran, Iran)

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