

Applications of Neutron Counting MCP/Timepix Detectors in Neutron Imaging and Diffraction Experiments

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Abstract

In this talk we will discuss the unique capabilities of neutron counting detectors with Microchannel Plates combined with a Timepix readout for various applications in neutron imaging and diffraction. With such detectors implemented at spallation neutron sources it is now possible to measure simultaneously more than 250,000 neutron transmission spectra, each within a 55 μm pixel. Despite substantial limitations of this method (e.g. integration of materials characteristics along the direction of neutron beam propagation) this novel technique can be attractive for some studies where other techniques fail due to opacity of the materials or due to bulky sample environment equipment. We present the results of studies of microstructure and elemental composition within various polycrystalline and single crystal materials. These experiments enable mapping of residual strain, uniformity of texture and location of various crystalline defects as well as mapping the bulk elemental concentration, all non-destructively. Investigation of dynamic processes, such as water penetration into various porous materials, in-situ crystal growth and annealing of materials as well as neutron imaging of highly radioactive samples will also be presented. © 2023 The Author(s)

Keywords : Neutron imaging, Non-destructive testing, Microstructure, Neutron diffraction.