

Gamma-Ray Analysis from Inelastic Neutron Scattering (GRAINS)

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The major reaction of fast neutrons at NECTAR is inelastic scattering, in which a lower-energy neutron and a medium-energy gamma photon is produced. The gamma rays are characteristic, i.e. they identify the emitter nuclide. Using the coincidence detection of these particles, elemental or isotope mapping of complex samples would be possible. Based on this approach, we propose an upgrade to the existing imaging capabilities at NECTAR, providing bulk isotope concentration determination to complement existing high resolution imaging capabilities at the instrument. Examples of this technique would range from: archeology, where the samples composition could be determined in 3D; batteries and fuel cells, where the chemical composition could be mapped in full size cells; industrial applications, where e.g. scintillators could be inspected for inhomogeneities in composition; all the way to inspection of hazardous materials that cannot be opened, e.g. nuclear waste forms.

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