



Transition-Edge Sensors and Particle Induced X-ray Emission Spectroscopy

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The transition-edge sensor (TES) technology has reached a level, where TES microcalorimeters can be applied in fields where its outstanding energy resolution combined with its broad detectable energy range can be utilized routinely in X-ray measurements.

The main application discussed here is the Particle Induced X-ray Emission (PIXE), where an accelerated ion beam is used to ionize the sample material, causing it to emit its characteristic X-rays. PIXE is thus a material characterization method, and it is most commonly applied in the determination of trace elements in a matrix of light elements.

In collaboration with NIST Boulder we have developed a measurement setup, where a 160 pixel Mo/Cu TES array is used in Particle Induced X-ray Emission measurements. Here we will show latest results of the measurements done with the setup including spectroscopic comparisons between the TES and silicon drift detectors, pigment measurements, determination of the energy efficiency of the detector setup, observation of chemical shifts of the characteristic X-rays in compounds, and studies of multiple ionization spectra caused by energetic heavy ions. In addition to benefits, the drawbacks of using low temperature detectors compared to more conventional detectors will also be discussed.

