

**MS43-2-1 Strain mapping of metallic cultural heritage objects with synchrotron microbeams
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Abstract

Diffraction mapping of metallic objects by high energy X-ray beams is a well-established method in order to spatially resolve their macroscopic and/or microscopic strain. Modern synchrotron sources allow to collect diffraction patterns with micrometre sized beams, resulting in high quality strain maps with an unprecedented resolution. So far, these methods were mostly used to study the influence of manufacturing processes and treatments on metallic components as well as symptoms of aging or fatigue on specimen.

Here we present a proof of principle of radiographic strain mapping as tool to retrieve erased hallmarks in metallic objects. We collected strain maps of different metal sheets marked with punch letters. Half of the letters were mapped as produced by powder X-ray diffraction, while the other half was erased by grinding until the letter could not be visually identified anymore before measurement. We could prove that in both cases an unambiguous strain pattern can be measured in the materials, which can be analyzed by Whole Powder Pattern Fitting methods (WPPF), Rietveld refinement or even decorrelated by Principal Component Analysis of the integrated raw data.

Based on these results, we believe that also illegible letters or hallmarks in metallic cultural heritage objects can be identified in a non-destructive way.