

NANO-BEAM X-RAY DIFFRACTION REVEALS STRUCTURAL AND MECHANICAL GRADIENTS IN NANO-CRYSTALLINE THIN FILMS

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The enormous strength of *nano-crystalline* domains predetermines the mechanical properties of various nature- or man-made nano-materials like bone or nanocrystalline thin films. For those materials, however, it is very difficult to assess microstructure and mechanical state at the sub-micron level. For that reason, a new approach to characterize gradients of composition, grain size, residual stress and texture in nanocrystalline thin films was developed at ID13 beamline of ESRF (Grenoble, France). The approach is based on cross-sectional scanning wide-angle X-ray diffraction performed in transmission geometry with a monochromatic beam of 200 nm. In the combination with finite-element modeling, the approach enables to assess the mechanical behaviour of compositionally graded nanostructures.