

NANOSTRUCTURE ANALYSIS USING 2D SMALL ANGLE X-RAY SCATTERING OPTIMIZED FOR FE-BASED ALLOYS.

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Nanostructure investigation using X-ray scattering makes it necessary to detect the signals in the immediate vicinity of the primary beam. With the NanoSTAR this can be done more accurately and much faster as ever before. This Nanostructure Analyzer is based on a combination of latest X-ray optics technology (Göbel Mirrors) with precisely machined mechanics (optical bench with Pinhole collimators, sample changer and primary beam stop) and a two dimensional multiwire proportional counter (HI-STAR). The control of the system and the data evaluation is performed by a powerful software package running under Windows 2000/NT (SAXS NT).

The nanostructure analysis of precipitates in Fe-based alloys (like secondary hardening precipitates in high speed steels) by the method of SAXS becomes possible by use of x-ray radiation which does not excessive excites fluorescence of the Fe. Cobalt radiation together with specially optimized multiplayer optics were chosen for investigating these type of materials.

Since the size and shape of these precipitates strongly influences the macroscopic mechanical properties, the knowledge of the time dependent behavior of these precipitates can be used to control the quality of the final product during the production process. Several examples are given for nanostructure characterization of precipitates in Fe-based alloys.