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# ABSTRACT BOOK

The layout of the SMS beamline and pertinent instrumentation will be reviewed briefly. The beamline capabilities will be illustrated by case studies mostly on structural polycrystalline bulk materials, e.g. the precipitation kinetics during annealing have been characterized by a combination of wide and small angle scattering.

In addition to grain averaging powder diffraction also grain resolved diffraction is performed. Case studies include so called far-field diffraction (where the orientation, size, position, and strain state of grains are probed) and high-resolution reciprocal space mapping investigating the evolution of the dislocation structure within individual grains during deformation. Finally, future developments will be anticipated.

# 155 Silicon carbide or aluminium oxide as an reinforcing phase for hot-pressed AlSi-based graded composites for automotive application

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Lightweight materials with high wear resistance, good thermal conductivity and enhanced mechanical properties are desired for modern brake discs in the automotive industry. One way to achieve this target is to use functionally graded metal-ceramic composite materials (FGMs). Besides improving the main properties, an FGM must ensure proper thermal conductivity of the system to release heat generated during brake operation and keep the residual stresses at acceptable levels.

Two ceramic materials, SiC and $Al_2O_3$, were used as the reinforcing phase of the AlSi12 matrix composites fabricated by powder metallurgy with a stepwise composition gradient (layered composites). The hot-pressing technique was employed to consolidate the powder mixtures with the volume fraction of the ceramics phase ranging from 10 to 30%. High relative density of the composite layers (above 99%) was obtained. Fracture toughness and flexural strength in a four-point bending ranged from 8.7 to 12.94 MPa and from 412 to 717 MPa, respectively. In-situ tensile tests under SEM allowed to analyze deformation and crack growth mechanisms on the microscale. Wear tests evidenced high wear resistance of the manufactured materials as compared with the reference material (grey cast iron). Results of the neutron diffraction experiments showed a desired effect of the FGM structure on decreasing the processing-induced residual stresses.

In parallel, FEM simulations based on the actual material microstructure reconstructed from micro-CT images were performed for thermal conductivity and thermal residual stresses to optimize the FGM structure and to answer the question which reinforcement (SiC or $Al_2O_3$) better serves the intended application.