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Microstructure and Mechanical behavior of Mg-5Zn matrix influenced by Particle Deformation Zone via in situ neutron diffraction

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Magnesium alloys have the advantages of low density, high specific strength and specific stiffness, so they have been widely used in many fields, such as aerospace, aerospace, automobile and electronic products, etc [1,2]. However, the application of magnesium alloys is limited because of the low modulus, low strength and poor plasticity at room temperature. In recent years, it has been found that the mechanical properties of magnesium alloys can be significantly improved by adding SiCp.

In this contribution the effect of particle deformation zone (PDZ) size on the microstructure and thus mechanical properties of SiCp/Mg-5Zn composites was studied. Furthermore, the work hardening and softening behavior of SiCp/Mg-5Zn composites influenced by PDZ size were analyzed and discussed using neutron diffraction under in-situ tensile deformation. Evolution of FWHM (full width at half maximum) extracted from the diffraction pattern of SiCp/Mg-5Zn composites was used to interpret the modification of dislocation density during in-situ tension, to elucidate their influence on the work hardening behavior of SiCp/Mg-5Zn composites.

A comprehensive overview on the deformation behavior of SiCp/Mg-5Zn composites will be given in this presentation. In particular, our results show that the work hardening rate of SiCp/Mg-5Zn composites increased with the enlargement of PDZ size, which was attributed the corresponding increase in grain size of composites. In addition, the stress reduction values increased continuously during in-situ tensile for SiCp/Mg-5Zn composites due to the stored energy produced during plastic deformation, which provided a driving force for softening effect.

Authors: HOFMANN, M. (Technische Universität München); Dr NIE, Kai-bo (Taiyuan University of Technology); Dr DENG, Kun-kun (Taiyuan University of Technology); Dr SHI, Quan-xin (Taiyuan University of Technology); Dr GAN, Wei-min (Helmholtz-Zentrum Hereon)

Presenter: Dr DENG, Kun-kun (Taiyuan University of Technology)

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