

## IN-SITU TEM INVESTIGATION ON THE MICROSTRUCTURE EVOLUTION AND DEFORMATION BEHAVIOUR OF HIGH PERFORMANCE MG ALLOYS

LI Jiehua, Montanuniversität Leoben  
SHAN Zhiwei, Xi'an Jiaotong University

Following up the project (06/2015) and the project (09/2016), the project (04/2017) was aimed to perform the in-situ TEM investigation, including in-situ TEM heating and cooling experiments to simulate the precipitation process (phase transformation at the solid state). Two Mg alloys systems have been tested. One is Mg-Zn-Gd-Zr alloy. The other is Mg-Al-Ca-Mn. It should be noted here that the in-situ TEM heating and cooling experiments is relatively complicated. The main problem comes from the TEM sample preparation using FIB, which is extremely time consuming and very expensive. Furthermore, it should also be noted here that there is still a lack of in-situ TEM tensile testing experiments on single precipitates within the Mg matrix to elucidate the deformation behaviour of single precipitates, which is very challenging at this moment. During this year, I was the winner of the international prestigious Humboldt Research Fellowships for experienced researcher. The research topic is about the solute segregation to grain boundaries in Mg alloys. I have worked with Prof Dierk Raabe in Max-Planck-Institut für Eisenforschung GmbH (MPIE) from 1 June to 31 September 2018. In MPIE, the solute segregation of Al, Ca, Mn to grain boundaries in Mg-Al-Ca-Mn alloys has been investigated in detail using TEM and atom probe tomography. Some nice data has been collected. At least one manuscript has been prepared for Acta Mater. Apart from the research work, during this year, two strong collaborations with another two partners (Jilin University, China, University of Sydney, Australian) have been established. Firstly, together with Prof. Huiyuan Wang in Jilin University, China, one new EPU project has been applied in 2018. Secondly, together with Prof Hala Zreiqat in University of Sydney, Australian, one project has been fixed in July 2018. Right now, one Ph.D student (Mr Jianing Zhu in Leoben) is working together with us on the development of novel Mg-Zn-Ca-Sn-Mn alloy for bio-application.

During this year, the project funding (€6000, with €4800 in advance and €1200 still left) is used to cover visits to China. It was almost spent up.

In summary, in the past three years, we worked on the in-situ TEM investigation on the microstructure evolution and deformation behaviour of high performance Mg alloys. Some nice data has been collected. Some important papers have been published. Although there is still a lack of in-situ TEM tensile testing experiments on single precipitates within the Mg matrix, the main research goal has been achieved.



Eurasia-Pacific Uninet, Veterinärplatz 1, 1210 Vienna, Austria

[eurasiapacific@vetmeduni.ac.at](mailto:eurasiapacific@vetmeduni.ac.at)  
+43 1 25077 4209

<https://www.eurasiapacific.info/>