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**MS-4-P-3413 Comparison of the 3D Calcium and Aluminium distribution in standard and ECO-Mg alloys**

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Due to their corrosion resistance, excellent mechanical properties, low density (one-quarter that of steel) and formability, magnesium-aluminium alloys are widely used. Especially automotive industry applications make many efforts to increase the fuel efficiency, but the amounts of magnesium per vehicle are very small in comparison to other materials such as steel, aluminium and plastics and therefore as one alternative step magnesium developed as a serious candidate for light weighting. And even for artificial replacements and biomedical implants magnesium alloys are considered to be the new basic material because of its good biocompatibility and biodegradation.

Continually improved and pushed by an ecological friendly awareness the early magnesium-aluminium alloys turned into the Environment CONscious magnesium alloys (ECO Mg). Some examples of alloys in use are AM50, ECO AM50, AZ91 and ECO AZ91. However, the properties of all are attributed to the combined effects of chemistry, heat treatment and microstructure. Especially the diffusion behaviour of aluminium in magnesium and in case of an ECO alloy the presence of calcium is important (Figure 1 and 2). But also knowledge of temperature caused the θ'' to θ' phase transition is essential. Optimizing the functionality of materials often depends on a precise control of the size, shape, crystal structure and composition of the material being synthesized. Many analysing methods were established in order to characterise solids in an appropriate way. Among several investigative tools and techniques like electron back scatter diffraction (EBSD) and transmission electron microscopy (TEM) the 3D micro-structural characterization of four different alloys (AM50, ECO AM50, AZ91 and ECO AZ91) were carried out on the FEI Nanolab Nova200 dual beam focused ion beam (DB-FIB) equipped with an energy dispersive X-ray detector (10 mm²) Quantax 400 system from Bruker using the Esprit software version 1.8.5. The serial sectioning thickness was selected to be 100 nm. Final data visualization was performed using the Avizo Fire software. The results give a three dimensional comparison of the differences in the elemental distribution, the chemical composition of the precipitates and the cell volumes. As an example Figure 3 and 4 shows a quantitative line scan of ECO AZ91.

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Fig. 1: Aluminium distribution in ECO AZ91

Fig. 2: Calcium distribution in ECO AZ91

Fig. 3: Scan direction

Fig. 4: Quantitative elemental distribution