Development of multi-component Mg-based AB alloy for Ni-MH Batteries

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It is becoming more and more important for decarbonization all over the world.(Cano et al., 2018; Fetcenko et al., 2007; Markolf et al., 2006)Today, fossil fuels are used in many vehicles, especially in the transportation sector. Although many electric vehicles continue to be developed, batteries with high energy density are also needed for these vehicles.

To meet this high energy need, rechargeable batteries with high energy density come to the fore. As an example of these batteries, Mg-based Nickel Metal hydride batteries come to the fore. These batteries stand out with their environmental compatibility and high charging capacity. (Rao & Wang, 2011; Wan et al., 2019) An interesting development within the interstitial hydrides relates to AB alloy with prototype MgNi CsCl structure). Recently, Mg-Co (Zhang et al., 2005), Mg-Ti (Asano et al., 2009), Mg-Ni (Shao et al., 2009), Mg-Ni-B (Shao et al., 2009) and Mg-Tm-V (Tm: transition metals) binary and ternary alloys have been successfully achieved with AB structure. In a binary alloy with a composition MgCo, 3 wt % was reported.

The concept of “high entropy alloys” which attracts great attention has modified the alloy design significantly. In this concept, rather than using the classical alloys which are based on a base metal with added alloying elements a new alloy design concept in which the alloying elements are much higher and nearly equimolar. These high entropy alloys are sometimes called multi-component alloys especially if the components are non-equimolar. Preparing Mg-based alloys with some other capable to store hydrogen alloys or metals with high catalytic activity or better anti-corrosion capability is an approach to improve the performance of Mg-based anodes in NiMH batteries.

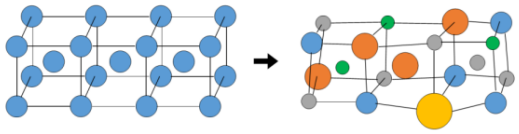

Figure 1. Simple illustration of the effect of multi-component alloying on the lattice distortion of a BCC crystal structure. (Sahlberg et al., 2016)

This study aims to develop Mg-based High-entropy alloys and rechargeable batteries with high charge-discharge capacity by appropriate electrochemical methods have the highest conductivities will be produced in the form of bulk discs and hydrogen permeability performance tests would be performed.

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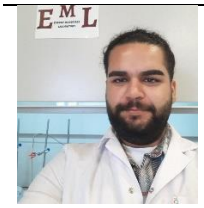

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