



Contribution ID: 103

Type: Poster

In-situ X-ray diffraction for hydrogen desorption behaviour of Mg-1wt.% Si alloy

Cast Mg-Si alloys are promising hydrogen storage and transportation media for renewable energy systems due to their low cost, light weight, and non-toxic properties. Phase evolution of Mg-1Si (wt.%) during the hydrogen desorption after the initial absorption was investigated using in-situ synchrotron powder X-ray diffraction (PXRD) at the Australian Synchrotron Powder Diffraction beamline. The Mg-1Si alloy was prepared by permanent mould casting and a trace Na addition (0.2 wt.%) was made prior to the casting to accelerate the initial hydrogen absorption process. The as-cast alloy was mechanically pulverised into fine powder and the powder of the alloy was hydrided at 350 °C, 2 MPa H₂ for 20 hours, absorbing 6.72 wt.% H₂ using Sieverts-type apparatus. The hydrided powder was then filled into a quartz capillary of 700 μ m in diameter. A hot air blower was used to heat the sample from room temperature to 500 °C after the first room temperature scan, and the in-situ PXRD patterns were collected during the H₂ desorption between 400 °C to 500 °C. The obtained PXRD patterns were Rietveld refined to acquire the sample compositions. The hydrogen release begins at 430°C and completes at 460°C, mainly associated with the phase change of MgH₂ to Mg, while the Mg₂Si phase is relatively stable throughout the desorption process. The results indicate that the Mg₂Si is not actively involved in the hydrogen sorption process, but a high density of interphase boundaries between Mg/MgH₂ and Mg₂Si may serve as hydrogen diffusion pathways, improving the H₂ sorption kinetics of the alloy.

Level of Expertise

Early Career <5 years

Presenter Gender

Man

Pronouns

He/Him

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