Mg-based materials for energy storage

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Body Centered Cubic (BCC) structure alloys have been studied by our team for a long history. But study on these alloys is facing technical barriers such as lack of fundamental knowledge of H status in BCC alloys and hydrides and difficulty to further increase hydrogen capacity from about 3 to 4 mass%. The maximum possible capacity of Mg-based BCC alloys is larger than 20 mass%, when all the octahedral and tetrahedral interstitial sites can be occupied by H atoms (Figure 1). Starting from what we have achieved in BCC alloys in the past years[1-2], we plan to tackle these roadblocks aiming at better understanding of relationship between structure and hydrogen storage property in Mg-based BCC alloys and development of alloys with large hydrogen capacity.

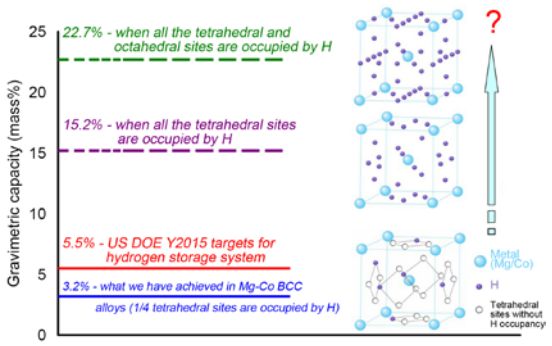

Figure 1 Possible hydrogen capacity in $Mg_{55}Co_{45}$ BCC alloy related to H occupancy status in different sites.

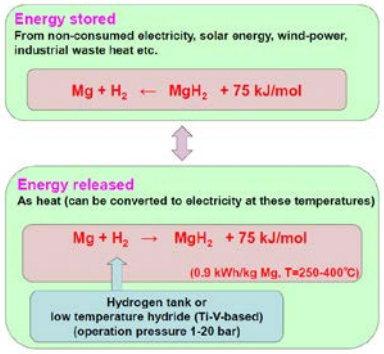

Figure 2 Schematic drawing of energy storage by Mg/MgH_2 system.

Something else we can do is Mg-based materials for energy (heat) storage (Figure 2). Energy storage is quite important in order to smooth out energy demands on energy production from peak hours/off-peak hours fluctuations of energy consumptions.

Andasol power station (Granada, Spain)-the largest solar thermal power plant connected with heat storage technique uses a mixture of 60%$NaNO_3$+40%KNO_3 molten salts for heat-storage. By connected with this system, this solar power plant may continue to generate electricity in evening or overcast days for 7.5 more hours. But from the energy density point of view, if using Mg-MgH_2 system[3-4], it may increase the energy capacity by a factor of 26.

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