Hydride-based thermal energy storage

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Reversible thermochemical reactions are suitable for storing thermal energy due to their high energy density compared to sensible or latent heat storage. In thermochemical heat storage, a thermochemical substance is converted into two other components with the addition of heat. Both can be stored separately. Recombination of the components restores the original thermochemical substance, releasing the same amount of heat that was previously stored.

For continuous power generation with solar thermal power plants and for the use of waste heat from industrial processes, the storage of heat at a temperature level between 400 and 800 °C is essential. High-temperature metal hydrides offer high heat storage capacities in this temperature range. Based on Mg and Ca compounds, these hydrides are in principle low-cost materials with excellent cycling stability. Since high-temperature metal hydrides can be used both as hydrogen storage and as heat storage, they are an ideal link to combine hydrogen and heat applications in different sectors.

Over the years, we have shown the use of high temperature metal hydrides in several demonstration projects. In our current project we have demonstrated the functionality of this storage materials in a technically relevant size of 350 kg MgH_2 storage material (250 kWh_{th}).