High Entropy Alloys for Hydrogen Storage Applications

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Abstract:

Metal hydrides are promising candidates for hydrogen storage over the past four decades. However, there is considerable variation in their thermodynamics resulting in inhibiting to achieve desired levels of volumetric and gravimetric capacity along with the kinetics and cycling of uptake and release of hydrogen. While alloying/ doping and nanoscaling can destabilize these hydrides to improve kinetics along with volumetric and gravimetric capacity, it has generally been difficult sofar to design a metal hydride that satisfies the delicate trade-off between appropriate thermodynamic stability and sufficiently high capacity (in addition to other desirable features like fast kinetics of dehydrogenation, reversibility, etc.). A relatively new class of materials known as high entropy alloys (HEAs), which find its way to many aplications, have recently been investigated as hydrogen storage materials. Beacuse of its four-core effect, HEAs demonstrated outstanding hydrogen-to-metal ratios (H/M > 2) and reversible weight capacities. In this lecture, we focus on the fundamentals of HEAs and how HEAs are proving to be better candidates for hydrogen storage applications relative to other metal hydrides.

Key words:

Metal hydrides, High Entropy Alloys, Hydrogen storage