

High Entropy Alloys for Hydrogen Storage

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Introduction:

- Hydrogen, a clean and versatile energy carrier, is pivotal for a sustainable energy future.
- Effective hydrogen storage is essential for promoting hydrogen-based energy sources.
- Many metal hydrides demonstrate an exothermic hydrogen absorption, offering compact and safer storage options with minimal risk of major hydrogen leaks.
- High entropy alloys (HEAs) offer promising solutions with unique properties for efficient hydrogen storage, while also enhancing safety and storage capabilities alongside metal hydrides.

Main Objective:

- To develop fundamental insight into HEAs with respect to their hydrogen storage performance.

Project Goals:

- Investigate why there is underutilization of hydrogen storage capacity in certain materials.
- Enhance hydrogen capacities and stabilities via alloy composition tuning.
- Explore hydrogen-to-metal ratios beyond standards in HEAs.
- Assess incorporating elements into HEAs while maintaining kinetics and reversibility.
- Examine the impact of non-hydride-forming elements in HEAs.

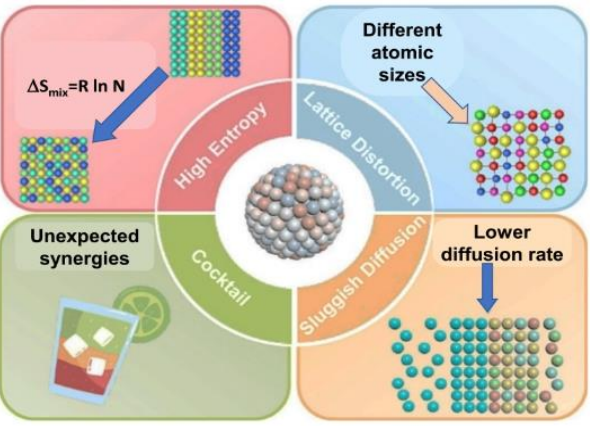


Fig.1 Schematic illustration of the four core effects affecting the properties of the HEAs [1]

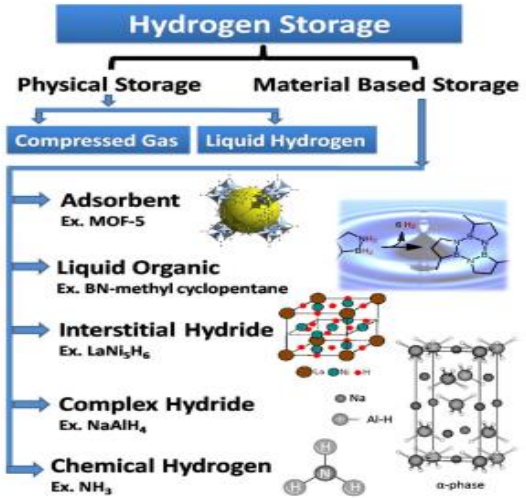


Fig.2 Different methods and phenomena of the various hydrogen storage systems [2]

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Related projects: FME HYDROGENI

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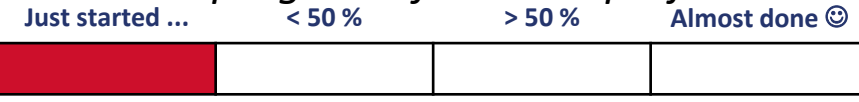
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Estimated progress of the PhD project:



References:

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2. Yadav, T.P., Kumar, A., Verma, S.K., et al. (2022). High-Entropy Alloys for Solid Hydrogen Storage: Potentials and Prospects. *Transactions of the Indian National Academy of Engineering*, 7, 147–156. DOI: 10.1007/s41403-021-00316-w.

• Sahlberg, M., Karlsson, D., Zlotea, C., et al. (2016). Superior hydrogen storage in high entropy alloys. *Scientific Reports*, 6, 36770. DOI: 10.1038/srep36770.



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