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Graphene-Supported Complex Hydrides as Advanced Hydrogen Storage Materials

Complex hydrides are a fascinating class of materials that can be used for several energy applications and devices, particularly as hydrogen storage materials owing to their high gravimetric and volumetric storage densities of hydrogen.[1] Nevertheless, complex hydrides still suffer from sluggish kinetics and poor reversibility owing to the grain growth, phase separation, and particle agglomeration during hydrogen sorption cycles at elevated temperature.[2] Downsizing materials to the nanometer scale is an effective way to relieve the inherent limitations to the diffusion of elements in the solid state and facilitate destabilization induced by excess surface energy.[3] Graphene with ultrahigh surface area could serve as a structural support to promote the synthesis of the nanostructured materials, but also physically prevent agglomeration and phase segregation during the hydrogen absorption and desorption cycles.[4,5] Therefore, space-confinement via graphene has been adopted as an effective tool to modify the hydrogen storage performance of complex hydrides. In this talk, I will first discuss the main ideas in this field, and then present some selected examples and our recent results of how the performance of complex hydrides can be improved through graphene.

References

[1] Orimo S. I.; Nakamori Y.; Eliseo J. R.; Zuttel A.; Jensen C. M., *Chem. Rev.*, 2007, 107, 4111.
[2] Niaz S.; Manzoor T.; Pandith A. H., *Renew. Sust. Energ. Rev.*, 2015, 50, 457.
[3] Yu X. B.; Tang Z. W.; Sun D. L.; Ouyang L. Z.; Zhu M., *Prog. Mater. Sci.*, 2017, 8, 1.
[4] Xia G. L.; Tan Y. B.; Chen X. W.; Sun D. L.; Guo Z. P.; Liu H. K.; Ouyang L. Z.; Zhu M.; Yu X. B., *Adv. Mater.*, 2015, 27, 5981.
[5] Zhang H. Y.; Xia G. L.; Zhang J.; Sun D. L.; Guo Z. P.; Yu X. B., *Adv. Energy Mater.*, 2018, 8, 1702975.

Figures

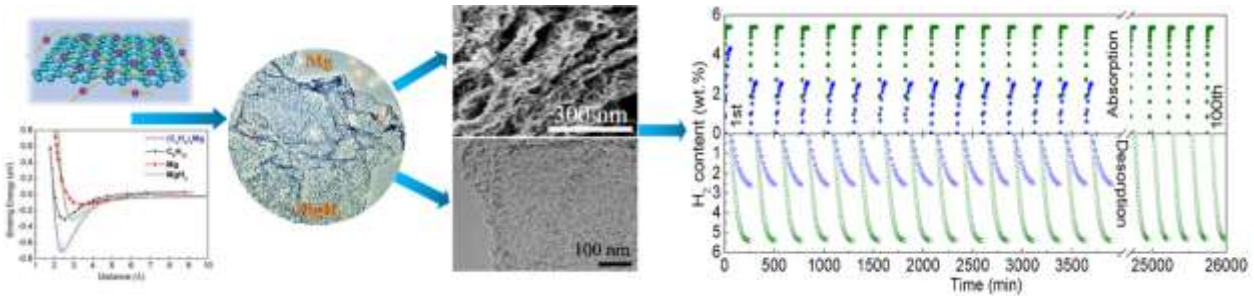

Figure 1: Self-assembly of metal hydrides nanoparticles on graphene and the induced excellent reversibility.