

Electronic Supplementary Information For

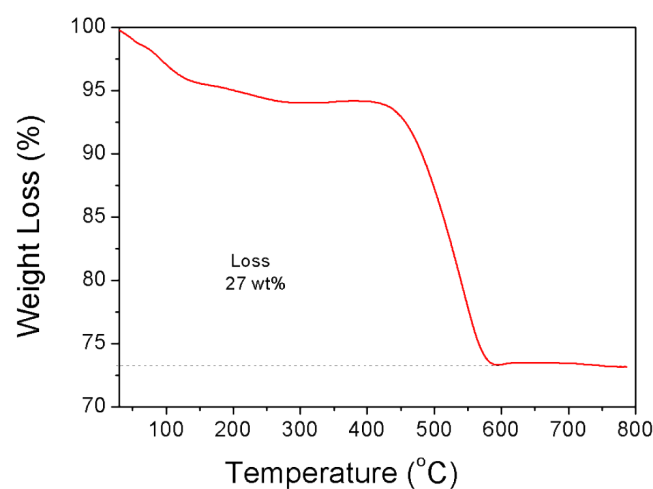
**Facile synthesis of TiN decorated graphene and its enhanced catalytic effects on dehydrogenation performances of magnesium hydride**

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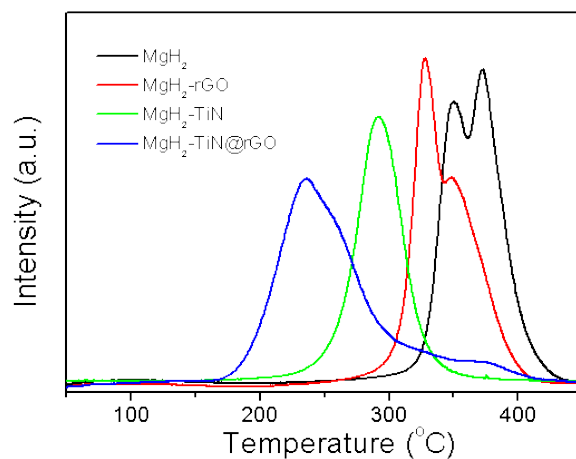
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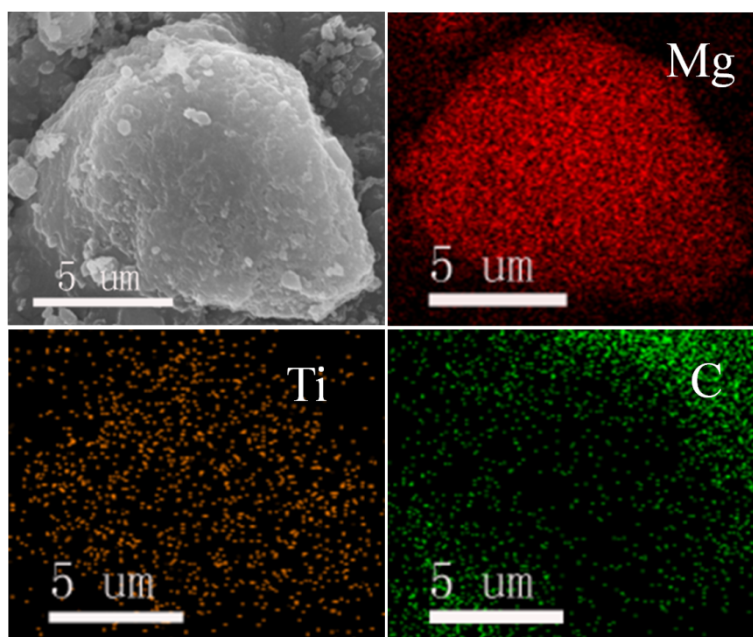
**Supplementary Figures**



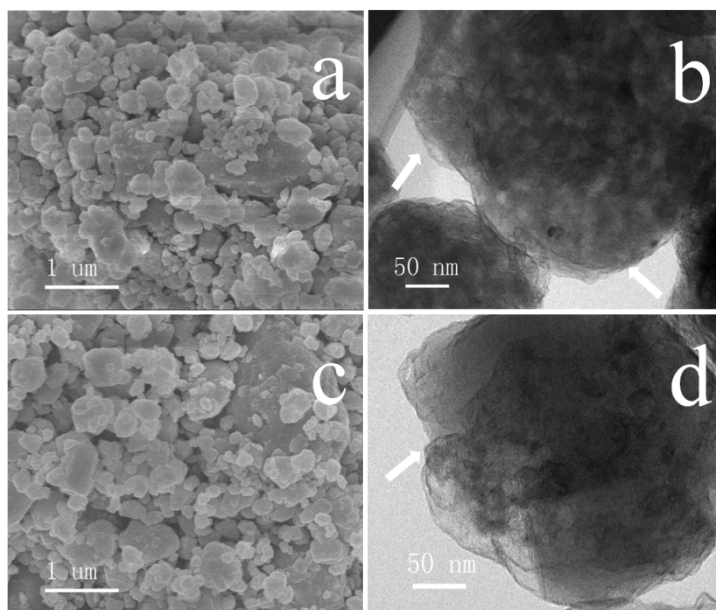
**Fig. S1** TG curve of TiN@rGO nanohybrids, measured in air atmosphere with a heating rate of 10 °C min<sup>-1</sup>.



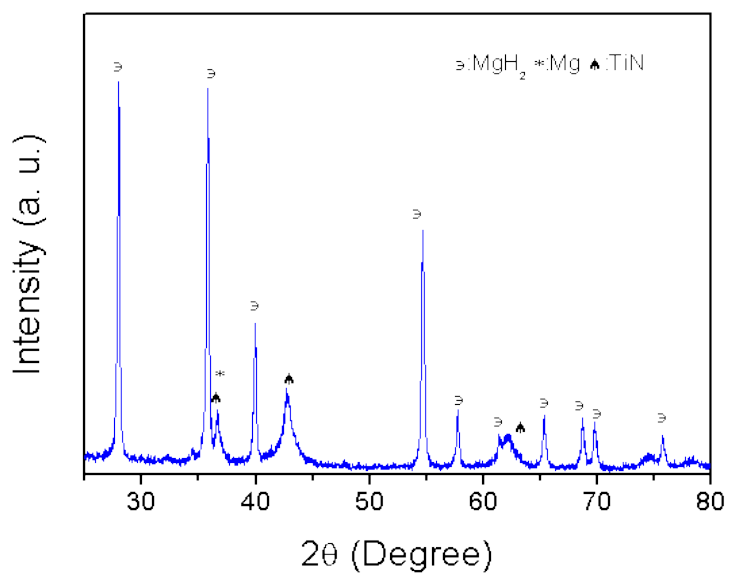
**Fig. S2** TPD curves of as-prepared pure  $\text{MgH}_2$ ,  $\text{MgH}_2\text{-rGO}$ ,  $\text{MgH}_2\text{-TiN}$  and  $\text{MgH}_2\text{-TiN@rGO}$  samples.



**Fig. S3** SEM and SEM-EDS elemental mapping images of the as-milled  $\text{MgH}_2\text{-TiN@rGO}$  composites.



**Fig. S4** (a) SEM and (b) TEM images of the as-prepared  $\text{MgH}_2\text{-TiN@rGO}$  sample. (c) And (d) show the SEM and TEM images of the dehydrogenated  $\text{MgH}_2\text{-Ti@rGO}$  composites. Arrows in the images point to the  $\text{TiN@rGO}$  nanosheets.



**Fig. S5** XRD curve of the re-hydrogenated  $\text{MgH}_2\text{-TiN@rGO}$  sample during the de/re-hydrogenation cycles.