Electronic Supplementary Information

*In situ* formed ultrafine NbTi nanocrystals from a NbTiC solid-solution MXene for hydrogen storage in MgH$_2$

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Fig. S1 TEM and SAED images of NbTiC (a) and NbTiAlC (b).
Fig. S2 Isothermal hydrogenation curves of the milled MgH$_2$.

Fig. S3 TPD curves of MgH$_2$-9 wt% NbTiC at different heating rates.
Fig. S4 XRD patterns of MgH$_2$-$x$ wt% NbTiC samples.

Fig. S5 Comparison of dehydrogenation curves of MgH$_2$ added with 9 wt% and 20 wt% NbTiC.
Fig. S6 XPS spectra of (a) Nd 3d of MgH$_2$-Nb$_2$C composite and (b) Ti 2p of MgH$_2$-Ti$_2$C.

Fig. S7 Raman spectra of pristine MgH$_2$, NbTiC and MgH$_2$-NbTiC composite.