Supplementary data

Few-layer MXene Ti₃C₂Tₓ supported Ni@C nanoflakes as catalyst for hydrogen desorption of MgH₂

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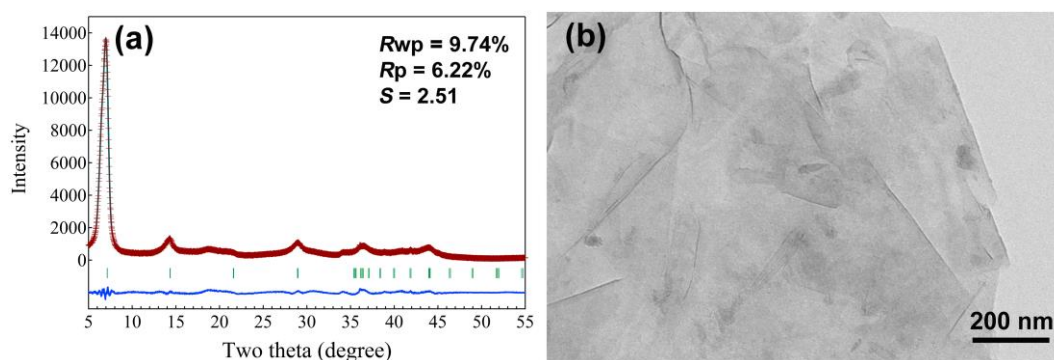
Fig. S1. (a) Rietveld refinement of the XRD pattern and (b) TEM image for as-prepared few-layer MXene Ti₃C₂Tₓ sample. For the Rietveld refinement of XRD pattern, the structural model of MXene was taken from reference (C. Shi, M. Beidaghi, M. Naguibo, et al., Structure of nanocrystalline Ti₃C₂ MXene using atomic pair distribution function, *Phys. Rev. Lett.*, 2014, **112,** 125501.).
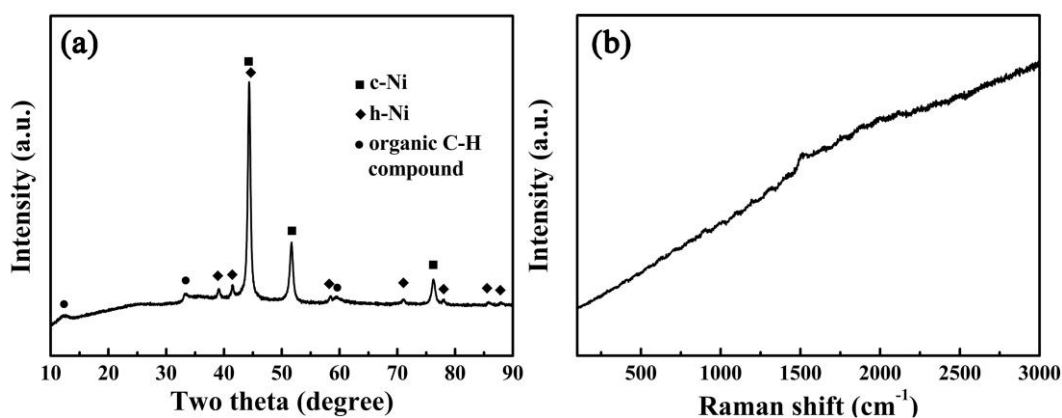

Fig. S2. (a) XRD pattern and (b) Raman spectrum of the dried product of solvothermal reaction of NiCp₂ in 10 ml THF-PO before calcination, showing the formation of cubic and hexagonal Ni without carbon.
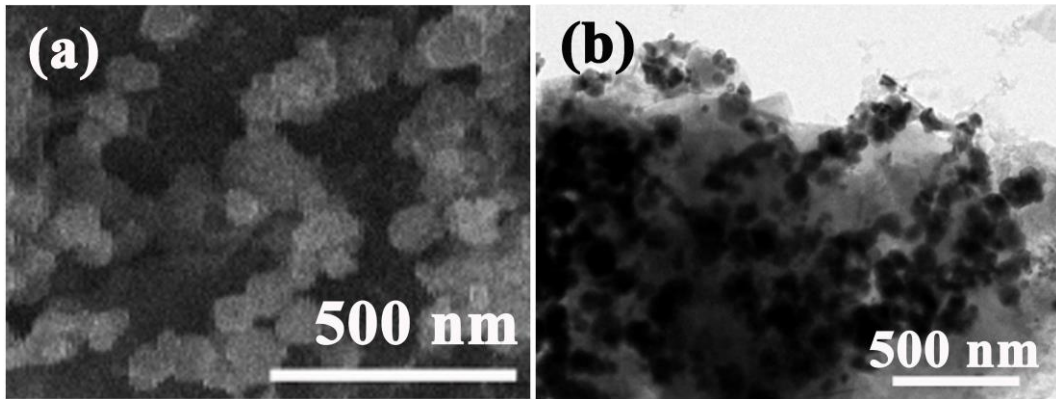
Fig. S3. (a) SEM and (b) TEM images of few-layer MXene $Ti_3C_2T_x$ supported Ni@C nanoflakes.
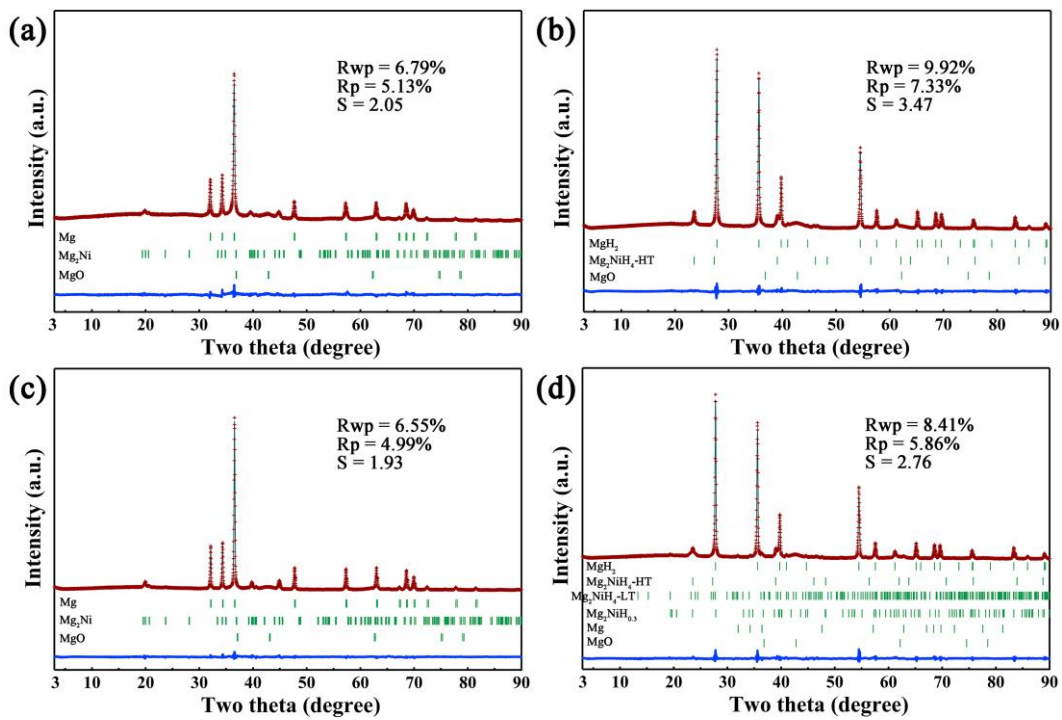
Fig. S4. Rietveld refinements of observed XRD patterns for the MgH_2–10 wt% Ni@C composite after the 1st desorption (a), 1st absorption (b), 50th desorption (c) and 50th absorption (d).
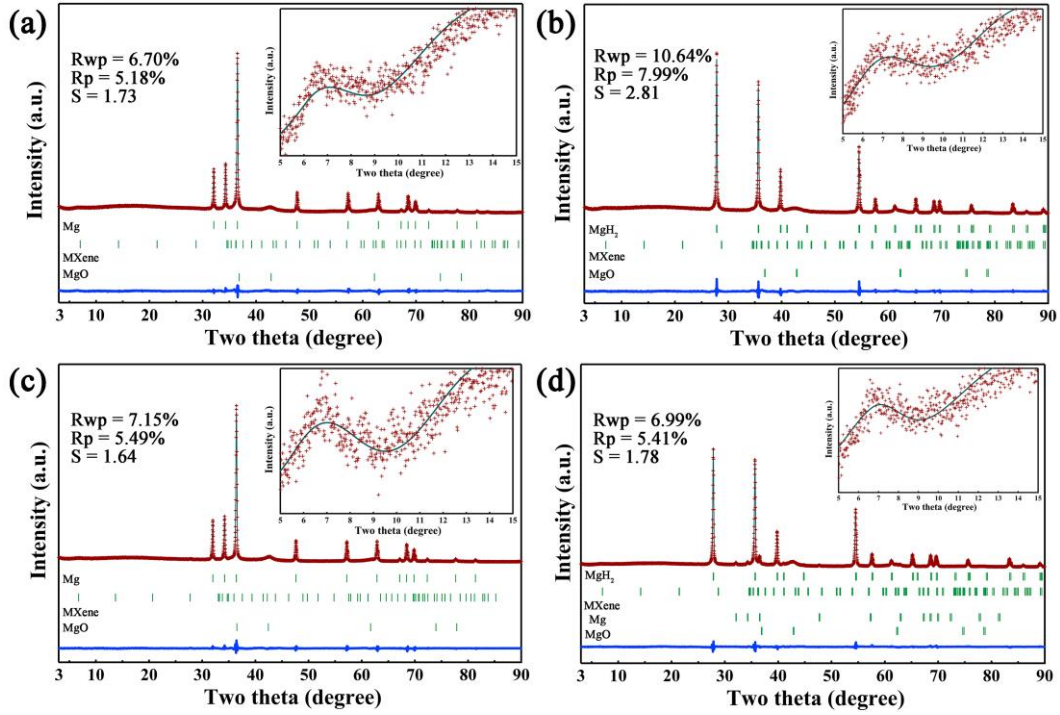
Fig. S5. Rietveld refinements of observed XRD patterns for the MgH_2–10 wt% FL-$Ti_3C_2T_x$ composite after the 1st desorption (a), 1st absorption (b), 50th desorption (c) and 50th absorption (d).
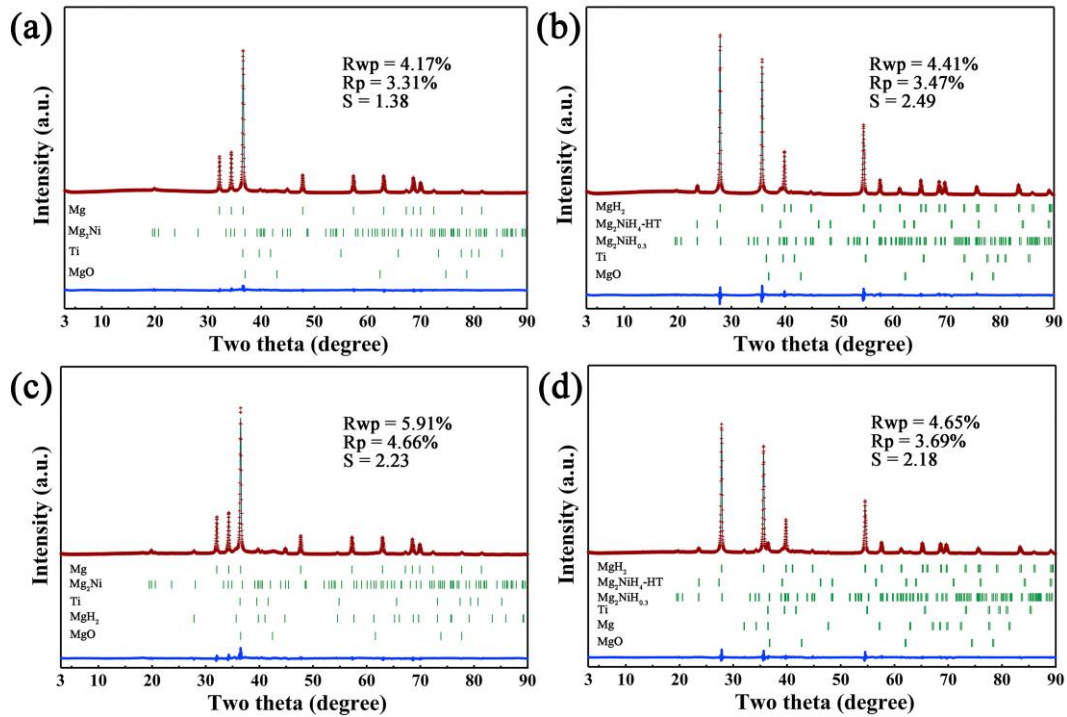
Fig. S6. Rietveld refinements of observed XRD patterns for the MgH_2–10 wt% Ni@C/FL-$Ti_3C_2T_x$ composite prepared by the excessive ball milling with a sample-to-ball weight ratio of 1:80 at 500 rpm for 24 h: after the 1st desorption (a), 1st absorption (b), 50th desorption (c) and 50th absorption (d).