Supporting information

- BET measurements

Results from TiS$_3$ grown on Ti discs show a BET surface area of $1.16 \pm 0.03\text{m}^2/\text{g}$. To know real area of TiS$_3$ nanoribbons, it is necessary to subtract the mass of the titanium substrate to the whole sample mass. Commonly smooth metallic surface (as that of Ti substrate) has around $1.00 \pm 0.02\text{m}^2/\text{g}$. Results show a TiS$_3$ real area of $67\text{m}^2/\text{g}$. Porosity has not been found in this material. Figure 1 shows the isotherm of this measures.

![Figure S1](image_url)

*Figure S1. Experimental nitrogen adsorption of TiS$_3$ nanoribbons at different relative pressure*
- X-ray diffraction of TiS$_3$ and TiS$_3$ flattened.

Figure S2. a) X-ray diffraction pattern of TiS$_3$ nanoribbons and b) X-ray diffraction pattern of flattened TiS$_3$.

- EDX analysis

Figure S3. Results of EDX Analysis of TiS$_3$ samples.
- Mott-Schottky plots at different frequencies

**Figure S4.** Capacitance of TiS₃ nanoribbons by EIS at different frequencies are indicated on the figures.
Stability

TiS$_3$ XRD pattern after hydrogen evolution process. It appears to be is similar to that of TiS$_3$ before that process. It means that chemical changes and/or structural degradation have not been occurs.

*Figure S5. X-ray diffraction of TiS$_3$ samples after hydrogen generation experiments.*