Supplementary information

**Electrochemical Synthesis of Ultrafast and Gram-Scale Surfactant-free Tellurium Nanowires by Gas-Solid Transformation and its Applications on Supercapacitor Electrode and P-doping of Graphene Transistor**

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**Video S1.** The supplementary video presents an overview of the experimental setup as well as the electrochemical reaction which leads to the synthesis of tellurium nanowire (dark precipitate) from a bismuth telluride bulk working electrode.

**Evidence of H$_2$Te gas:** The evolution of H$_2$Te gas during the electrochemical reaction was verified by suspending a Si substrate above the electrolyte surface (figure S1 a,b), and the H$_2$Te derived tellurium was detected after the electrolysis. Three peaks of H$_2$Te derived tellurium in Raman spectrum located at 92.4, 121.6, and 141.1 cm$^{-1}$ are corresponding to E$_{\text{t}}$(transverse), A$_1$, and E$_{\text{u}}$(transverse) Raman-active modes, respectively. These peaks are also consistent with the Raman spectrum from pure bulk Te (figure S1 c). The SEM image of H$_2$Te derived tellurium on Si substrate shows a blade shape rather than nanowire shape in electrolyte solution (figure S1 d).
**Figure S1.** (a)(b) Two-electrode system for the Te NWs synthesis and a suspended Si substrate upon the electrolyte. (c) Raman spectra of Te bulk and H₂Te derived Te. (d) SEM image of H₂Te derived Te.