Supporting Information (JA071323Z)

Magnesium Nanowires: Enhanced Kinetics for Hydrogen Absorption and Desorption

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Figure S1. Schematic diagram of (a) the whole experimental setup and (b) the enlargement of the screen mesh as well as the reusing treatment that consists of the following two steps: (1) The products depositing on the substrate were collected through a vibratory screen separator, which was used to separate the products from the mesh substrate by vibration produced by ultrasonic waves or a vibratory motor; (2) In order to reuse the substrate, the screen mesh was dipped in 0.5 mol·L⁻¹ HCl solution for 30 min, and then washed with distilled water and acetone for several times.
Figure S2. X-ray diffraction (XRD) patterns of the as-prepared three Mg products: (a) Sample 1, (b) Sample 2, and (c) Sample 3. Inset shows the structure of the unit cell of bulk Mg.
Figure S3. Nitrogen adsorption/desorption isotherms for the as-prepared Mg nanowires: Sample 1 (S-1), Sample 2 (S-2), Sample 3 (S-3).
Figure S4. X-ray diffraction (XRD) patterns of (a) Sample 1, (b) Sample 2, and (c) Sample 3 after the first absorption process at 573K (●: β-MgH₂; *: Mg). Inset shows the structure of the unit cell of bulk β-MgH₂.
Figure S5. Arrhenius plots for the hydriding (a) and dehydriding (b) kinetics of the three Mg nanowires (the blue, red and black dotted lines refer to Sample 1, 2 and 3, respectively).
Figure S6. van’t Hoff curve (logarithm of the equilibrium hydrogen pressure vs. the reciprocal temperature, \(\ln(P_{eq}/P_{eq}^0)=(\Delta H/R)(1/T)–\Delta S/R)\) for Sample 1. The slope of the line is equal to the enthalpy of formation divided by the gas constant, and the intercept is equal to the entropy of formation divided by the gas constant. The van’t Hoff curves for Sample 2 and 3 are similar to that of Sample 1.
Figure S7. TEM image of Sample 1 after 3 cycles of hydriding and dehydriding.
Figure S8. TEM image of Sample 1 after 10 cycles of hydriding and dehydriding.