

## Enhanced chemical stability of VO<sub>2</sub> nanoparticles by the formation of SiO<sub>2</sub>/VO<sub>2</sub> core/shell structures and the application to transparent and flexible VO<sub>2</sub>-based composite foils with excellent thermochromic properties for solar heat control

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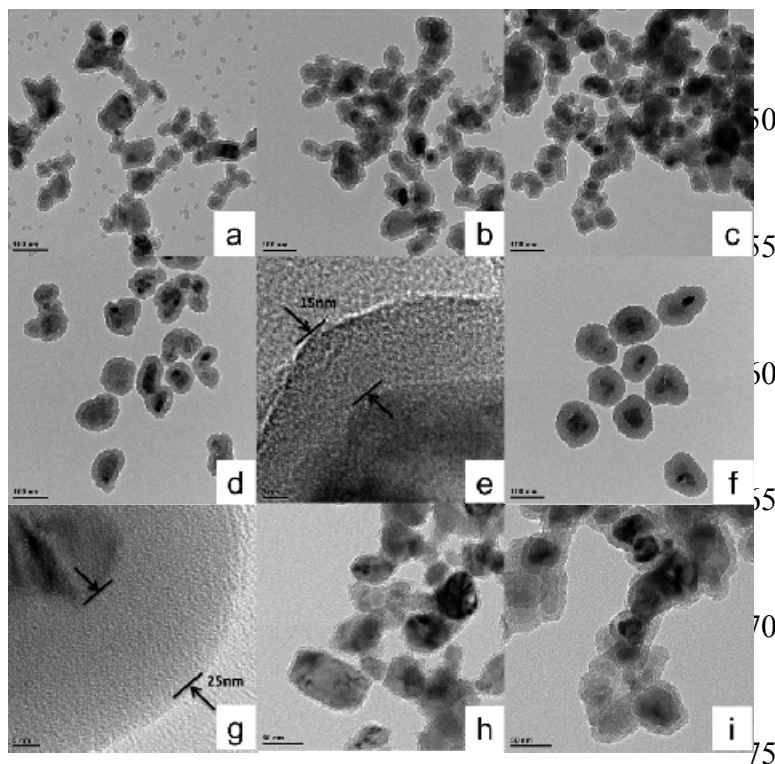
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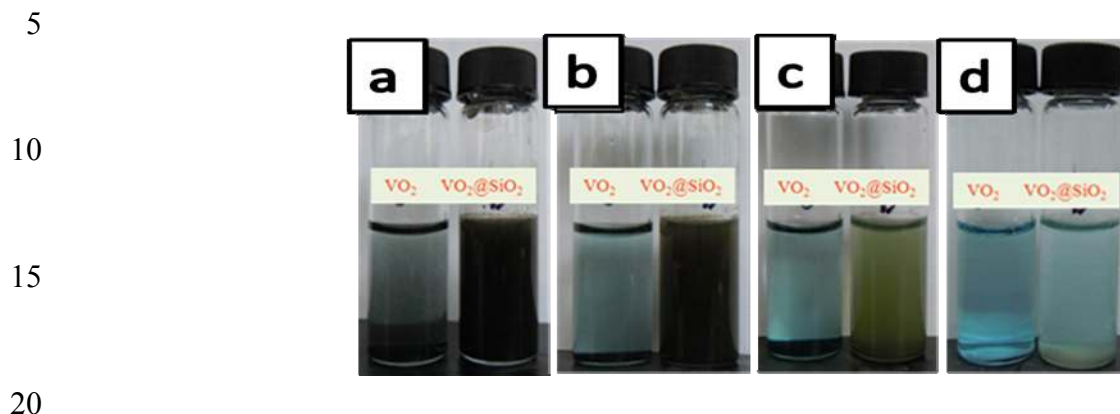
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**Supporting Figure S1.** TEM images of VO<sub>2</sub>@SiO<sub>2</sub> synthesised under different synthetic conditions (see Table 1 for details) (a) S1, (b) S2, (c) S3, (d) S4, (e) HRTEM image of S4, (f) S5, (g) HRTEM image of S5, (h) S6, and (i) S3. Silica shells with an average thickness of approximately 9 nm had already been deposited on the VO<sub>2</sub> surfaces after soaking for 3 h. By prolonging the time to 6 h, the number of homogeneous SiO<sub>2</sub> particles significantly decreased but remained observable, and the average thickness of the SiO<sub>2</sub> increased to approximately 13 nm. After soaking for 12 h, the separate SiO<sub>2</sub> particles nearly disappeared, but the thickness of

the SiO<sub>2</sub> was nearly unchanged. Increasing the amount of added TEOS from 0.4 mL to 1 mL while leaving other parameters unchanged increased the silica shell thickness from approximate 15 nm to 25 nm.



**Supporting Figure S2.** Photographs of uncoated VO<sub>2</sub> nanoparticles and VO<sub>2</sub>@SiO<sub>2</sub> nanoparticles in 0.1 M hydrochloric acid at room temperature for different durations: (a) 1 min, (b) 10 min, (c) 20 min, and (d) 1 h. The uncoated VO<sub>2</sub> immediately began to dissolve, and the solution appeared to be limpid. In comparison, the coated sample exhibited no obvious changes after the initial 1 min. When the exposure time was increased from 1 min 25 to 20 min, the blue colour of VO<sup>2+</sup> ions was easily seen, as shown in Supporting Figures S2 b-c, whereas the VO<sub>2</sub>@SiO<sub>2</sub> exhibited a relatively slow dissolution rate. White SiO<sub>2</sub> was observed at the bottom of the bottle (Supporting Figure S2 d) after 1 h of reaction for the VO<sub>2</sub>@SiO<sub>2</sub> particles.

