

Single Step Hydrothermal Synthesis of Phase-Pure Monoclinic Vanadium Dioxide Nanocrystals for High-Performance Smart Windows

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Here, we demonstrated the single-step hydrothermal synthesis of VO₂(M) nanocrystals (NCs). Thermochromic VO₂(M) NCs were synthesized using phase-pure vanadium precursors obtained by size-selective purification. VO₂(M) NCs exhibited enhanced luminous transmittance (55%) and solar modulation ability (18%), the value of the latter being one of the highest reported for hydrothermally synthesized VO₂(M). W-doped VO₂(M) NCs showed superior phase transition behaviors to those of undoped VO₂(M) NCs, while the phase transition temperature was systematically reduced depending on the W-doping concentration. In addition, we experimentally demonstrated that integrating the W-doped VO₂(M) into the window of a model house reduced the in-house temperature under daytime solar radiation, which exhibits the potential of our VO₂(M) films for use in energy-saving window applications.