

Phase Transition Temperature Control of VO₂ Nanoparticles for Smart Window Applications

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The monoclinic vanadium dioxide, VO₂ (M), is considered an ideal intelligent material because of the low value of its reversible critical phase transition temperature. VO₂ (M) nanoparticles doped with Nb and W were easily synthesized by hydrolysis and subsequent thermal decomposition; both the Nb and W dopants had no significant influence on the VO₂ (M) crystalline structure. The transition temperature of Nb-doped VO₂ (M) was reduced from 60 to 19.6 °C upon Nb doping, and decreased by around 10 °C per atomic percent of Nb dopant. The transition temperature of VO₂ (M) can be accurately adjusted to room temperature by W-Nb co-doping, for use in smart windows. A film prepared using co-doped VO₂(M) nanoparticles showed a solar modulation ability of ~18% and a luminous transmittance of 50%, indicating that the co-doped VO₂ (M) nanoparticles represent suitable candidates for smart window applications