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Fabrication and formation mechanism of porous VO_2 thin films with superior thermochromic performances

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VO_2 is the most ideal thermochromic material, which is often used for making smart windows with a transition temperature close to room temperature. Its thermochromic performances can be enhanced by introducing well-distributed pores. However, it is a challenge to form well-distributed pores in the high pure M/R phase VO_2 film. Here we report on a novel, cost effective one-step method to create well-distributed pores while ensuring the formation of relatively high pure M/R phase VO_2 thin films. The derived single-layer thin film exhibits superior thermochromic performances, e.g., high luminous transmittance (~60%) and large solar modulating ability (~8.5%). These findings open a new vista for fabrication of porous VO_2 thin films with outstanding thermochromic properties. We also present some results about the thermal, mechanical and chemical stabilities of the thin film and discuss the mechanism of the interconnection between the film and the glass substrate.

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