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Preparation and thermochromic properties of sol-gel-derived Zr-doped VO_2 films

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Abstract

Vanadium dioxide (VO_2) films were prepared on the glass substrates with a sol-gel process using polyvinyl pyrrolidone as a crosslinking agent. Zirconium ions were doped to decrease the phase transition temperature of VO_2 films. X-ray diffraction, electrical resistance and optical transmittance spectra were measured to study the microstructure and thermochromic properties of Zr-doped VO_2 films. The XRD peaks of Zr-doped VO_2 shifted towards small angles as the amount of zirconium increased, indicating an enlargement of lattice constants, which can be attributed to the larger radius of Zr^{4+} ions. The phase transition temperature of VO_2 film reduced with increasing Zr^{4+} doping amount. When the amount of Zr^{4+} increased up to 2 wt %, the critical temperature of phase transition decreased to 50°C while the visible optical transmissivity almost remained the same.

Key words: Vanadium dioxide film; Zirconium ion doping; Thermochromic; Critical temperature

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