Thermochromic multilayer films of VO_2 and TiO_2 with enhanced transmittance

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Abstract

Thermochromic films of VO_2, as well as multilayer films of VO_2 and TiO_2, were made by reactive DC magnetron sputtering. Spectrophotometrically measured transmittance and reflectance were used to determine optical constants pertinent to temperatures below and above a temperature-induced structural change at $\tau_c \approx 60$ °C. We then used computations to optimize multilayer films for specific applications and, specifically, demonstrated that $TiO_2/VO_2/TiO_2$ films could display a luminous transmittance significantly higher than that of bare VO_2 films, and that $TiO_2/VO_2/TiO_2/VO_2/TiO_2$ films could yield a large change of solar transmittance for temperatures above and below τ_c. Our data can serve as starting points for developing novel coatings for windows with superior energy efficiency.

Keywords

Thin film;
Thermochromism;
Vanadium dioxide;
Energy efficiency