Properties of Vanadium Dioxide Coatings for Smart Window Applications

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Abstract

Vanadium Dioxide (VO_2) is a smart material which exhibits a phase transition at a temperature of 68°C in its pure and single crystalline form. The phase transition from the monoclinic semi-conducting form to the tetragonal metallic (rutile) form is also accompanied by a change in the optical properties of VO_2. This simultaneous optical shift goes from an optically transparent to an optically opaque material where a change in solar radiation transmittance is observed. Although the introduction of a dopant into the lattice structure of VO_2 has proven to decrease the transition temperature to near room temperature, the optical transmittance capability as well as the nature of the transition remains a challenge (1).
This research involves the development of a doped VO_2 coating for smart window applications with enhanced properties. Apart from producing thermochromic VO_2 with a reduced transition temperature, the focus is also largely placed on improving the optical properties of this material in the visible range of the electromagnetic spectrum. The nanophotonic and thermochromic properties of the developed material are studied using various physical and electrochemical analytical techniques.

Due to this thermochromic property, VO_2 has received worldwide attention as a prospective material for energy saving technologies (2). As a direct result of the thermochromic property of this material, this technology will play a significant role in energy saving due to its ability to maintain temperature within a building or vehicle. The ultimate aim of this research is therefore; to develop a simple and cost effective chemical process for producing VO_2 coatings with overall enhanced properties which will ultimately aid in the commercialization of this material.

References

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