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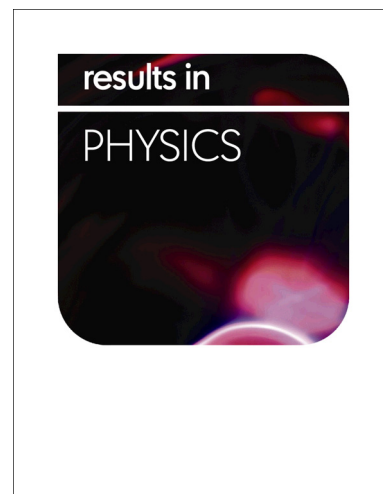
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Sol-gel preparation of self-cleaning SiO₂-TiO₂/SiO₂-TiO₂ double-layer antireflective coating for solar glass

Wensheng Lin[†], Jiaxian Zheng[†], Lianghong Yan^{*}, Xinxiang Zhang^{*}

Abstract: Self-cleaning SiO₂-TiO₂/SiO₂-TiO₂ double-layer antireflective (AR) coating is prepared by sol-gel process. SiO₂ sol is prepared by using tetraethyl orthosilicate (TEOS) as precursor and ammonia as catalyst, while TiO₂ sol was prepared by using tetrabutyl orthotitanate (TBOT) as precursor and hydrochloric acid as catalyst. The effect of TiO₂ content on refractive index, abrasion-resistance and photo-catalytic activity of SiO₂-TiO₂ hybrid thin films or powders is systematically investigated. It is found that the refractive index of SiO₂-TiO₂ hybrid thin films increases gradually from 1.18 to 1.53 as the weight ratio of TiO₂ to SiO₂ increased from 0 to 1.0. The SiO₂-TiO₂ hybrid thin film and powder possesses good abrasion-resistance and photo-catalytic activity, respectively, as the weight ratio of TiO₂ to SiO₂ is 0.4. The degradation degree of Rhodamine B by SiO₂-TiO₂ hybrid powder is 88.3%. Finally, SiO₂-TiO₂/SiO₂-TiO₂ double-layer AR coating with high transmittance, abrasion-resistance and self-cleaning property is realized.

Keywords: Sol-gel process; antireflective coating; silica; titania; self-cleaning

1. Introduction

Photovoltaic (PV) power is one of the renewable energies, which has been developing rapidly in China because of the environmental problem. PV installations were installed outdoors and even in the sun-baked deserts. Therefore, glass covers are essential for preventing PV cells from damage of physical shock and corrosion. The refractive index of glass covers is approximately 1.52. The difference between air and glass cover results in about 8% reflection on the surfaces of cover glass. This reduces the efficiency of the PV cells. Antireflective (AR) coatings have been widely used in optical devices and energy-related applications to reduce transmission losses [1-4]. An ideal homogeneous AR coating can realized 100% transmittance at a specific wavelength when its

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