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Self-cleaning ceramic tiles coated with Nb₂O₅ doped-TiO₂ nanoparticles

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Abstract

In this work, 5 mol% Nb₂O₅-doped TiO₂ synthesized sol was sprayed on glazed ceramic tiles. The crystallization of TiO₂ nanoparticles occurs on the surface of the tiles after annealing at 600-900 °C, this innovative approach leads to a drastic decrease in the titania grain size as detected by SEM and XRD. The superhydrophilic and self-cleaning performance was evaluated by measuring the water contact angle under UV irradiation and by degradation of methylene according to ISO 10678 and JIS R1703-2. The results showed a high performance of doped samples at all temperatures tested, with a marked dependence on the anatase-to-rutile ratio and crystallite size. At 800 °C, the doped samples achieved water contact angle near to zero in just 15 min of UV irradiation, which confirms the high performance of the self-cleaning ceramic tiles.

Keywords: Ceramic tiles; photocatalytic activity; superhydrophilicity; self-cleaning effect; nanoparticles; titania.

1. Introduction

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