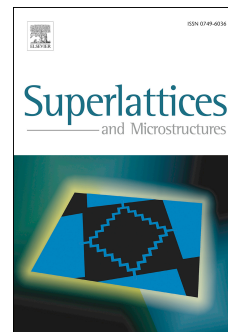


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Crystalline deformation and photoluminescence of titanium dioxide nanotubes during in situ hybridization with graphene: An example of the heterogeneous photocatalyst

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Abstract: In this work, we hydrothermally synthesized titanium dioxide nanotube (TNT), and grew graphene/TNT (Gr/TNT) composites in situ in a graphene solution. Transmission electron images indicated a homogeneous distribution of TNT, and co-existence of TNT and graphene in the composite. The crystalline structure, which was characterized by X-ray diffractometry, showed deformation of the TNT anatase phase. This suggests formation of heterogeneous junctions between TNT and graphene. The photocatalytic activities, investigated with methylene blue, showed that the composite had a better photocatalytic ability than the TNT sample. This result was further substantiated by the photoluminescence emission spectra. The normalized photoluminescence intensity of Gr/TNT indicated a lower radiative recombination rate than that of TNT. Moreover, the emission characteristic peaks of TNT in the composite sample were red-shifted, which could enhance photon absorption in visible light. The photocatalytic enhancement in the Gr/TNT composite, in relation to the formation of heterojunctions, was determined and clarified.

Keywords: homogeneous photocatalyst; titanium dioxide nanotube; mechanical graphene; hydrothermal synthesis

1 INTRODUCTION

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