Influences of Nb Doping into Structural and Morphological Properties of TiO_2 Nanorods Array

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Titanium dioxide is widely used in industrial applications for it has great properties such as high thermal and chemical stability. Among the applications were photocatalytic degradation of pollutants, ultraviolet photosensor, and solar cells. While most of the initial investigations on TiO_2 were focused on 0D nanoparticles, they have several problems such as fast recombination and slow carrier transfer. This can be solved by using 1D nanostructures such as nanorods and doping with foreign materials such as niobium (Nb) which can increase its surface area, improve its charge carrier transfer, and increase its carrier concentration. While excellent electrical and optical properties have been proven form past studies, this study focuses on effect of Nb-dopant to morphological effect of the TiO_2 nanorods. Nb-doped rutile TiO_2 nanorods were fabricated *via* low temperature hydrothermal reaction method with different molar ratio of Nb-dopant. Results shows affected morphology of rutile TiO_2 nanorods after being doped with Nb-dopant. Diameter of the nanorods increased when compared to pristine TiO_2 nanorods while its thickness decreased as a result of reduced anisotropic (110) plane surface energy after Nb doping. Density of the nanorods were also decreased as a result of Nb-dopant attached on the nucleation sites of the nanorods thus disrupting its early growth. Meanwhile, photocurrent of the sample shows increasing current for 2.6 mM of Nb doping. Present study suggests that morphology of the rutile TiO_2 nanorods were affected and the carrier transport can be enhanced with low concentration of Nb doping.

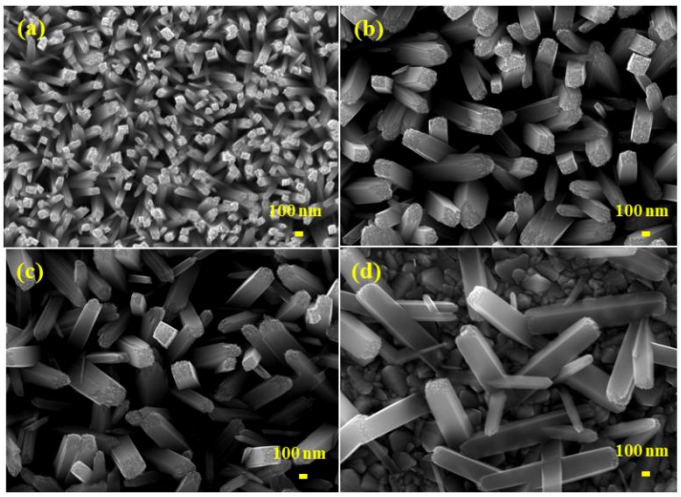

Figure 1: Morphological images of Nb-doped rutile TiO_2 nanorods with (a) 0.0, (b) 2.6, (c) 5.0, (d) 10.4 mM of Nb dopant