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Anodic growth of Nitrogen-doped Titanium Dioxide Nanotubes by Anodization process of elemental Titanium in ethylene glycol based electrolyte solution with different water contents

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Abstract

Anatase Nitrogen-doped Titanium Dioxide (Nitrogen-doped TiO₂) nanotubes were grown via an anodization process in an ethylene-glycol based electrolyte solution containing ammonium fluoride (NH₄F) and different water contents (2-4 Vol%). These electrolyte solutions act as the dopants sources of Nitrogen in anodic TiO₂ nanotubes. The influence of different water content of electrolyte solution on physical properties of the Nitrogen-doped TiO₂ nanotubes was studied. It was observed that the diameter of the Nitrogen-doped TiO₂ nanotubes was increased by the water content increasing of the electrolyte solution. Also, the Nitrogen-doped TiO₂ nanotubes which grown in the electrolyte solution with 3 Vol% water content had maximum length. An energy dispersive X-Ray analysis (EDX) revealed that the TiO₂ nanotubes were heavily doped with Nitrogen. UV-Vis diffuse reflectance spectroscopy (DRS) and Photoluminescence (PL) measurements showed that the Nitrogen-doped TiO₂ nanotubes had narrow band gap energy (lower than 3 eV).

Keywords: TiO₂ nanotubes, anodic growth, water content, electrolyte solution, Nitrogen-doping

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