

International Journal of Applied Ceramic Technology / Volume 15, Issue 6 / p. 1577-1583

ORIGINAL ARTICLE

Effects of metal doping agent on the properties of Nb_{2-x}M_xO₅ (M = Mn, Fe, and Ni) system

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First published: 21 May 2018

<https://doi.org/10.1111/ijac.13022>

Citations: 3

Abstract

In order to improve the behavior Niobium pentoxide on oxidation-reduction reactions to degrade organic compounds in aqueous solutions, we developed the synthesis of Niobium pentoxide with the metal doping agents: manganese, iron, and nickel (Nb_{2-x}M_xO₅), respectively, and analyzing its effects on the structural and vibrational properties. The synthesis of the Nb_{2-x}M_xO₅ (M = Mn, Fe, and Ni; x = 0.02 and 0.05) was performed according the Pechini method, but before the annealing, the samples were submitted to Thermogravimetric analysis study showing better pre-calcination annealing temperatures at 500 and 700°C for the materials. Then, we performed the crystal structural analysis by X-ray Diffraction, obtaining crystallite sizes between 15 and 47 nm, the accurate size analysis was calculated by Scherrer equation. Structural analysis was also performed by IR spectroscopy to evaluate the vibrational modes of synthesized samples. The doping effects were evaluated by UV-Vis spectrophotometry through the energy band gap values, showing that doped samples with manganese and iron had lower values than undoped, except the sample doped with nickel. However, samples doped with iron at 2.5% showed better photocatalytic performance.

Citing Literature





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