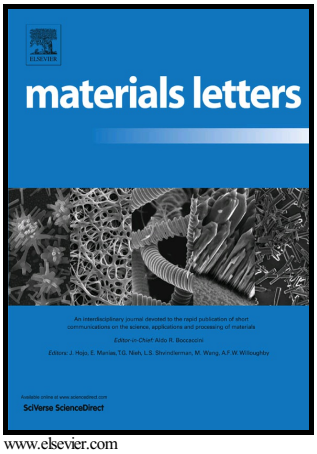

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Enhancement of symmetry-induced photoluminescence in bismuth tungstate microcrystals

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Abstract

Bi_2WO_6 (BWO) powders synthesized via hydrothermal processes were studied in order to determine the effect of structure on photoluminescence (PL). BWO samples were characterized using X-Ray Powder Diffraction, UV–vis diffuse reflectance, field emission scanning electron microscopy, and PL intensity measurements. Orthorhombic structures were observed in all samples. A change in crystal microstructure and optical band gap was observed. The PL intensity obtained with different samples varied, with the highest intensity obtained with BWO fabricated with polyvinylpyrrolidone (PVP). Using Raman spectroscopy, a change in the microcrystal symmetry from *$P2_1ab$ to B2cb* was observed and found to be responsible for the increase in photoluminescence.

Keyword: Bismuth tungstate; Structural change; Photoluminescence

1. Introduction

Metal tungstates have been the subject of much attention because of their large range of chemical and physical properties [1, 2]. Bi_2WO_6 (BWO), in particular, has been widely investigated because of its interesting ferroelectric [3] and piezoelectric [4] properties, as well as its catalytic potential [5, 6], optical properties [7], and magnetic characteristics [8]. It is crucial to investigate the photoluminescence (PL) properties of bismuth tungstates because these materials are promising candidates for application as optical scintillators [7, 9]. Structural network reconfiguration is a potentially important way to increase the PL properties of inorganic solids. Reconfiguration can be achieved by altering the conditions during metal tungstate synthesis such as doping-level [10, 11], synthesis methodology [12, 13], and other factors [14]. Although it is known that the PL of metal tungstates is directly linked to WO_4^{2-} electronic transitions, the creating of structural defects has also been proven to be a very important factor in the