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Comment on "Molten Salt Synthesis of Bi_2WO_6 Powders and its Visible-Light Photocatalytic Activity" in Materials Research. 2019; 22(5): e20190311

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Recently, Dai et al. published a paper in Research Materials 2019; 22(5): e20190311. They have investigated the visible-light photocatalytic activity of the synthesized Bi_2WO_6 powders[1]. In the context of determining of band gap energy based on diffuse reflectance measurements, the cited authors make some mistakes, which are clarified in the present letter.

Keywords: *Diffuse Reflectance Spectroscopy, Kubelka-Munk function, Absorption coefficient.*

1) $\alpha h\nu = A\left(h\nu - E_g\right)^2$ was designed by Kubelka-Munk (K-M) equation[1], which is incorrect. In fact, $\alpha h\nu = A\left(h\nu - E_g\right)^2$ is a classical equation from the optical transitions theory in semiconductor/insulator materials[2]. On the other hand, the dimensionless K-M function/equation ($F(R)$) is defined as the ratio between the K-M absorption and scattering coefficients[3]. In the vicinity of E_g, the scattering phenomenon can be neglected, that is, the scattering coefficient is treated as a constant[4], therefore: $F(R) \propto \alpha$
2) According to the referred authors[1], the parameter A is usually 1. In fact, the value of A does not interfere in the determination of the band gap energy (E_g) because it is an independent parameter of photon energy ($h\nu$)[5]. However, its value depends on properties such as the number of unit cell or even the type of electronic transition between the valence and conduction bands[6]. In this sense, it is unlikely that its value is usually 1.
3) According to inset of Figure 5, $(\alpha h\nu)^{1/2}$ is plotted against the $h\nu$, where α is the absorption coefficient of material and represents the probability of light being absorbed per unit path length[7]. Consequently, the unit of measure for $\alpha h\nu$ is unit of energy divided by unit of length and not eV as declared by the authors[1]. However, as the values presented on the ordinate axis in the inset shown in Figure 5 were obtained from the absorbance measurements, the most appropriated unit for $\alpha h\nu$ is "arbitrary unit".

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