論　文　要　旨
Thesis Abstract

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主論文題名　（Title）

Alkali Metal Bismuthate and Bismuth Vanadate Microstructure for Visible Light Driven Photocatalytic Activity

内容の要旨　（Abstract）

The photocatalyst such as titanium dioxide (TiO_2), is known for its effectiveness in treating waste from industrial pollutions such as dyes, pesticides and other emerging contaminants. In decades, TiO_2 has attracted attention from worldwide researchers because it is cheap, abundant and stable. However, TiO_2 is not ideal and performs poorly in processes associated with solar photocatalysis due to its large band gap (3 to 3.2eV) that results in utilizing not more than 5% of the total solar energy ($\lambda < 387nm$). Therefore, in this research, we are trying to find alternative materials that can endeavor better results or at least, identical to TiO_2 in the degradation of organic dye under visible light irradiation ($\lambda < 387nm$) by approaching the simple and low cost synthesize method.

In order to find alternatives materials, we will be focusing on the bismuth-based semiconductor that has a potential for visible light responsive photocatalysts. This is because it has an electronic structure which its valence band consists of hybrid orbitals of O 2p and Bi 6s. The Bi 6s orbitals results in increasing the mobility of its photo-generated charge carriers, besides decreasing the band gaps to less than 3.0 eV. Due to its potential, varieties of bismuth-based semiconductor with various morphologies have been studied for its photocatalytic activity such as $NaBiO_3$, $KBiO_3$, $LiBiO_2$, $Bi_{11}VO_{19}$ and $BiVO_4$. In this study, we have divided the study into two main parts, which are the alkali bismuthate materials such as $NaBiO_3$, $KBiO_3$ and $LiBiO_2$ that are efficient in the decolorization of the dyes and the bismuth vanadate such as $Bi_{11}VO_{19}$ and $BiVO_4$ that can mineralize the dye effectively.

Accordingly, in this study, we have successfully understood the degradation of dyes by $NaBiO_3$ in various pH conditions that provide in a better understanding in developing new photocatalytic materials. Besides, we have successfully synthesized the alkali metal bismuthate of potassium and lithium by a simple solid state reaction, using $NaBiO_3$ as the starting materials. Furthermore, we have achieved various morphologies and microstructures such as $Bi_{11}VO_{19}$ and $BiVO_4$ just by using a simple precipitation method in the synthetization process.