NF-001

Synthesis of ZnO nanoparticles and their photocatalytic activity under UV light

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Zinc oxide is metal oxide semiconductor with the 3.37 eV bandgap energy. Zinc oxide is very attractive materials for many application fields. Zinc Oxide has many advantages such as high conductivity and good transmittance in visible region. Also it is cheaper than other semiconductor materials such as indium tin oxide (ITO). Therefore, ZnO is alternative material for ITO. ZnO is attracting attention for its application to transparent conductive oxide (TCO) films, surface acoustic wave (SAW), films bulk acoustic resonator (FBAR), piezoelectric materials, gas-sensing, solar cells and photocatalyst.

In this study, we synthesized ZnO nanoparticles and defined their physical and chemical properties. Also we studied about the application of ZnO nanoparticles as a photocatalyst and try to find a enhancement photocatalytic activity of ZnO nanorticles..

We synthesized ZnO nanoparticles using spray-pyrolysis method and defined the physical and optical properties of ZnO nanoparticles in experiment I. When the ZnO are exposed to UV light, reduction and oxidation (REDOX) reaction will occur on the ZnO surface and generate O2- and OH radicals. These powerful oxidizing agents are proven to be effective in decomposition of the harmful organic materials and convert them into CO2 and H2O. Therefore, we investigated that the photocatalytic activity was increased through the surface modification of synthesized ZnO nanoparticles. In experiment Ⅱ, we studied on the stability of ZnO nanoparticles in water. It is well known that ZnO is unstable in water in comparison with TiO2. Zn(OH)2 was formed at the ZnO surface and ZnO become inactive as a photocatalyst when ZnO is present in the solution. Therefore, we prepared synthesized ZnO nanoparticles that were immersed in the water and dried in the oven. After that, we measured photocatalytic activities of prepared samples and find the cause of their photocatalytic activity changes.

Keywords: ZnO nanoparticles, Photocatalytic activity, Redox reaction, Methyleneblue, UV light