課題番号　　:F-21-NU-0062
利用形態　　:共同研究
Program Title (English)　:Green-Synthesis of Iron Oxides-based Magnetic@Semiconductor Nanoparticles using Moringa Oleifera (MO) Extract, Investigation of their Microstructures and Magnetic properties, and their application for Photocatalyst and Biosensors.
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キーワード／Keyword　　: Green-Synthesis, Photocatalyst, Biosensors, 分析

1. 概要 (Summary):

Fe_3O_4 and Fe_3O_4/TiO_2 magnetic nanoparticles have been successfully prepared using an eco-friendly green synthesis method with various *Moringa Oleifera* (MO) extract concentrations. Fe_3O_4 nanoparticles is a cubic inverse spinel structure with an average particle size of 9.2–11.7 nm and lattice parameters is in the range of 8.14–13.60 Å and the MO did not change the morphological structure of Fe_3O_4. The absorption edges of Fe_3O_4, Fe_3O_4-MO, and Fe_3O_4/TiO_2-MO were 187.9 nm, 198.7 nm, and 197.1 nm, respectively. The bandgap energy of Fe_3O_4-MO is in the range of 2.62–2.66 eV and the bandgap energy of Fe_3O_4/TiO_2-MO is 2.76 eV which explains that it depends on the bioactive compounds. Based on these results, the green synthesis nanoparticles have the potential to be applied in the industrial sector, especially for photocatalyst applications.

2. 実験 (Experimental)

【利用した主な装置】

磁気特性評価システム群

【実験方法】

Fe_3O_4-MO nanoparticles were synthesized using coprecipitation method. 4.054 g $FeCl_3.6H_2O$ and 2.086 g $FeSO_4.7H_2O$ were dissolved in 15 ml of distilled water and both solutions are stirred. The MO solution was added to the Fe_3O_4 solution and stirred for 30 minutes at 60 °C (600 rpm). 30 ml of 10 % ammonia solution was added dropwise into the solution and stirred for 90 minutes. The nanoparticles were subsequently magnetically separated by an external magnetic field and then washed with distilled water several times. The precipitated Fe_3O_4 nanoparticles were dried for 2 hours at 100 °C

3. 結果と考察 (Results and Discussion)

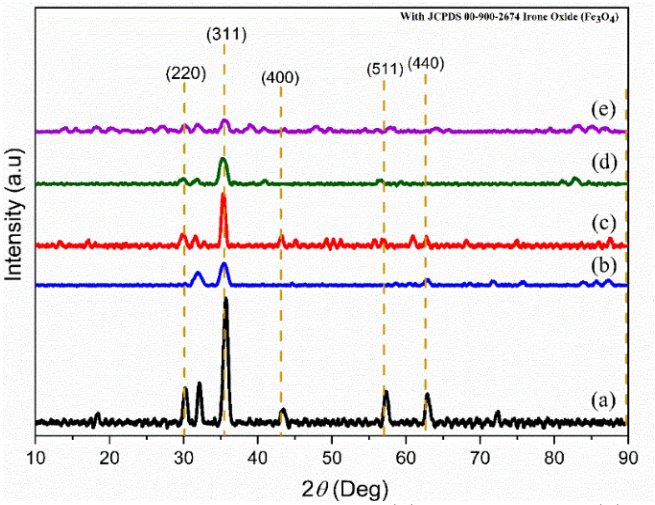

Fig. 1 XRD patterns of Fe_3O_4 (a), Fe_3O_4-MO5 (b), Fe_3O_4-MO10 (c), Fe_3O_4-MO15 (d), and Fe_3O_4-MO20 (e).

The XRD patterns of Fe_3O_4, Fe_3O_4-MO variation, and Fe_3O_4/TiO_2-MO nanoparticles are shown in Fig. 1. It was found that there is exist strong diffraction peaks with 2θ values of 30.1 °, 35.5 °, 43.1 °, 57.0 °, and 62.6 ° which are related to the reflection of (200), (311), (400), (511), and (440) corresponding to JCPDS Card No.00-900-2674. These peaks are demonstrating cubic inverse spinel structure of Fe_3O_4 which are sharp and intense to be well crystallized structure.

4. その他・特記事項（Others）

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5. 論文・学会発表 (Publication/Presentation):

None

6. 関連特許（Patent）

None