Sintesis Material Mesopori Fe2O3 TiO2 dari Mineral Ilmenit Bangka sebagai Fotokatalis = The Synthesis of Mesoporous Fe2O3 TiO2 Materials from Bangka-Indonesia Ilmenite as Photocatalyst

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Abstrak

[ABSTRAK
Indonesia memiliki banyak sumber daya alam ilmenit yang dapat dimanfaatkan lebih lanjut menjadi material mesopori Fe2O3 TiO2. Material mesopori dengan dinding (wall) yang tersusun atas nano-kristalin TiO2 adalah kandidat yang sangat menjanjikan dalam memberikan sumbangan yang sangat signifikan untuk mengatasi permasalahan lingkungan dan krisis energi yang melanda dunia. Namun demikian, hingga sekarang ini masih sulit untuk memperoleh kombinasi sinergis dua hal utama yaitu susunan pori yang teratur (highly-oriented) dan tingkat kristalinitas yang tinggi.
Penelitian ini bertujuan untuk mensintesis mesopori Fe2O3 TiO2 dari mineral ilmenit (FeTiO3) untuk aplikasi pemurnian air limbah dan pembuatan prototipe DSSC. Metode yang digunakan dalam penelitian adalah kombinasi teknik hidrotermal dan sol−gel. Tahapan proses adalah mineral ilmenit yang telah dihaluskan dilakukan proses dekomposisi dengan larutan basa dalam autoklaf kemudian dilanjutkan dengan proses pelindian menggunakan asam sulfat. Larutan TiOSO4 yang dihasilkan digunakan sebagai prekursor dalam mempersiapkan nanopartikel TiO2 atau material mesopori Fe2O3 TiO2. Pengontrolan dalam proses sol−gel dilakukan dengan penambahan Fe, dextrin dan triblock copolimer. Hasil penelitian dikarakterisasi menggunakan XRF, AAS, TEM/SEM, BET, XRD, DRS, UV Vis.
Hasil penelitian memberikan gambaran tentang potensi yang besar terhadap ilmenit Bangka untuk dimanfaatkan sebagai bahan baku dalam pembuatan material mesopori Fe2O3 TiO2. Ilmenit terdekomposisi dengan pelarut basa (KOH dan NaOH) membentuk fase intermediet yaitu kalium titanat dan natrium titanat dengan morfologi yang berbentuk benang-benang halus. Penambahan bubuk Fe dan dextrin mampu mengontrol pembentukan nanopartikel dan meningkatkan kemurnian TiO2. Penelitian ini juga berhasil mempersiapkan mesopori Fe2O3 TiO2 yang digolongkan sebagai bidang kristal anatase maupun rutil dengan ukuran kristal rata-rata berkisar 5 -7 nm, energi band gab berkisar 3,00 ? 3,16 eV dan luas permukaan, SBET berkisar.100 ? 151 m2/g.;
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ABSTRACT
Indonesia has many natural resources including ilmenite which could be exploited further into mesoporous TiO2 Fe2O3 materials. Mesoporous materials

with walls composed of nano-crystalline TiO2 are very promising candidate in a very significant contribution for solving environmental problems and energy crisis that hit in the world. However, until now it is still difficult to obtain a synergistic combination of two major things that the regular arrangement of pores (highlyoriented) and a high degree of crystallinity.
This study aims to synthesize mesoporous TiO2 Fe2O3 of the ilmenite (FeTiO3) mineral for waste water purification applications and prototyping DSSC. The method used in the study is a combination of hydrothermal and sol-gel techniques. Stage of the process was ilmenite mineral which has been smoothed carried out the decomposition process using alkaline solution in the autoclave and then followed by a leaching process using sulfuric acid. The TiOSO4 solution obtained was used as a precursor in the preparation of TiO2 nanoparticles or mesoporous TiO2 Fe2O3 material. Controlling the sol-gel process was done with the addition of Fe, dextrin and triblock copolimer. The results of the study were characterized using XRF, AAS, TEM/SEM, BET, XRD, DRS, UV-Vis apparatus. The results of the study provided an overview of the enormous potential of the Bangka-Indonesia ilmenite to be used as raw material in the manufacture of mesoporous TiO2 Fe2O3 materials. Ilmenite decomposed by alkaline solvent (KOH and NaOH) formed the intermediate phase of potassium titanate and sodium titanate with morphology shaped by fine threads. The addition of Fe powder and dextrin were able to control the formation nanoparticles and increase the purity of TiO2. This study also succeeded in preparing mesoporous TiO2 Fe2O3 classified as anatase and rutile crystal planes with an average crystal size ranges from 5 to 7 nm, the band gap energy ranges from 3.00 to 3.16 eV and the surface area (SBET) ranges from 100 to 151 m2/g.;Indonesia has many natural resources including ilmenite which could be
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