

Studi Pengaruh Jumlah Ti₃₊ pada TiO₂ Nanotube Terdekorasi Nanopartikel Emas (AuNp) sebagai Katalis Reaksi Konversi Nitrogen Menjadi Amonia = Study of the effect the amount of Ti₃₊ on TiO₂ Nanotubes Decorated with Gold Nanoparticles as Catalysts for Nitrogen Conversion to Ammonia

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Abstrak

Amonia merupakan bahan kimia yang penting dan banyak digunakan dalam berbagai proses industri kimia. Amonia diproduksi dalam skala industri melalui proses Haber-Bosch. Dalam proses tersebut gas H₂ dan N₂ direaksikan pada suhu dan tekanan tinggi, serta menggunakan hidrokarbon dari minyak bumi sebagai sumber protonnya. Dalam penelitian ini, sintesis NH₃ dilakukan secara fotokatalitik, dalam tekanan dan suhu ruang, menggunakan gas nitrogen dan sumber proton dari air. Pada penelitian sebelumnya digunakan fotokatalis TiO₂ yang diperkaya dengan spesi Ti₃₊ yang disiapkan secara elektrokimia. Pada penelitian ini dilakukan pengembangan matrik sistem Ti₃₊ TiO₂ nanotube, dengan upaya meningkatkan populasi spesi Ti₃₊₉ dan menedekorasinya dengan nano partikel emas. Sistem fotokatalis Au/Ti₃₊/TiO₂NT yang dihasilkan saat direndam dalam larutan 0,1 M Na₂SO₄ dan dialiri gas N₂, serta disinari dengan sinar tampak menghasilkan NH₃, dengan konversi sinar ke produk ammonia sebesar 0.026%.

.....Ammonia (NH₃) is an important chemical and is widely used in various industrial processes. Ammonia production in an industrial scale is conducted through the Haber-Bosch process, where in this process H₂ and N₂ gases are reacted in a high temperatures and pressures. In addition, in that process the hydrocarbon was used as proton precursor. In this research, the photocatalytic method of producing NH₃ from water, as proton source, and N₂ at atmospheric pressure and room temperature is being investigated. In the previous study, it was reported that a specific enriched TiO₂ semiconductor material with Ti₃₊ showed its potential to photocatalytically conver nitrogen to ammonia, under UV irradiation. In this study, the photocatalyst matrix was improved by increasing the Ti₃₊ species population and decorating with gold nanoparticle. The resulted photocatalyst system, namely Au / Ti₃₊ / TiO₂-NT, then was immersed in 0.1M of Na₂SO₄ solution, under N₂ bubbling, and exposed by visible light, and consistently ammonia productions were observed. In the present condition an efficiency of solar to ammonia production was approximately 0.026% .