Weekit Sirisaksoontorn 2009: Preparation of N-doped TiO_2 to Use as Catalysts in Photodegradation Reaction of PAHs and Phenol. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Associate Professor Apisit Songsasen, Ph.D. 165 pages.

N-doped TiO_2 was prepared via the sol-gel method, which varied titania precursors and nitrogen sources. From the characterization results, it was found that N-doped TiO_2 using titanium(IV) tetraisopropoxide with ammonia solution and calcined at 673 K provided the most appropriate properties for acting as the photocatalyst. TGA, Raman and XRD results indicated that this N-doped TiO_2 catalyst had high crystallinity because its titania precursor was simply hydrolyzed completely so no organic contents blocked initial phase construction. SEM and TEM results demonstrated that its surface morphology was spherical like fluffy powders. Moreover, with increasing calcination temperature, its anatase-to-rutile phase transformation was retarded by the incorporated nitrogen. Elemental Analysis and UV-Vis/DR results also suggested that nitrogen could be dormant in the TiO_2 lattice with strong bonds, causing the effect on the band gap structure by adding energy states nearly valence band of TiO_2. All of these properties enhanced the photocatalytic activity of N-doped TiO_2 under visible light.

Regarding the photocatalytic activity, N-doped TiO_2 using titanium(IV) tetraisopropoxide with ammonia solution and calcined at 673 K succeeded in degrading phenanthrene, benz[a]anthracene and phenol with the highest efficiency. However, its photocatalytic activity was drastically decreased when it was calcined at higher temperature. Additionally, the plausible mechanism was also proposed in case of photodegradation of phenanthrene based on two detected intermediates by GC/MS; bis(2-ethylhexyl)benzene-1,2-dicarboxylate and dimethyl-4-methyl-1,2-benzene dicarboxylate.

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