# Degradation of Sulfur Containing Pollutants Using Zinc Oxide Based Photocatalysts

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## Abstract

Photocatalytic degradation of thiourea in aqueous solution by UV radiation has been studied. In comparison with titanium dioxide, zinc oxide shows significantly higher catalytic activity. Experimental results indicate that the degradation process follows first order kinetics. The effect of catalyst concentration, substrate (thiourea) concentration, medium pH, annealing temperature of the catalyst, effect of doping with nickel, cobalt, iron and selected formed products during the degradation were also analyzed.

Medium pH had great influence on photocatalytic activity of zinc oxide. Both acidic and basic conditions it was markedly decreased. Highest degradation of thiourea under the usage of untreated zinc oxide was reported with 300 ppm zinc oxide at pH 7. Dramatic increase in photocatalytic activity of zinc oxide was achieved by temperature treatment. Approximately 75% degradation of thiourea was reported at the end of the two hour UV irradiation under the usage of 200 $^{0}$C temperature treated zinc oxide. Among the nickel, cobalt and iron doped zinc oxide, nickel doped zinc oxide exhibited considerable enhancement in photocatalytic activity. At the end of two hour UV irradiation concentrations of sulfate, nitrate and nitrite were reported as 16.92 ppm, 2.10 ppm and 0.01 ppm respectively and pH of the medium reported as 6.3. Sulfite and ammonium ions were not reported (Initial thiourea concentration was 100 ppm). Nitrate showed fluctuation of its concentration during the cause of irradiation. Reaction mixture was also analyzed for zinc level after two hour UV irradiation in order to investigate the stability of zinc oxide with medium pH and metal doping. Tests results revealed that neutral pH conditions and cobalt doping enhance the stability of zinc oxide.