

Photocatalytic decomposition of low-concentration aqueous ammonia over Pt/TiO₂

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In the waste water, ammonia is a general pollutant, which severely endanger the aquatics. There are several methods to deal with ammonia, such as stripping an ion exchange. However, the necessary operation in basic conditions of these methods is the major disadvantage for practical application, resulting in the generation of new contaminants.

In this work, the photocatalytic process was carried out by using Pt/TiO₂. The morphologies of the Pt on this photocatalyst were obtain by HRTEM and the Pt content was analyzed by ICP-OES. A glass reactor containing variant concentration of ammonia was used to simulate an aquarium. Under UVA irradiation at room temperature, the ammonia was degraded over Pt/TiO₂ from 10 to 3 ppm, which is the safe situation for regular fish. The change in concentration of ammonia and other derivatives during reaction was measured by an ion chromatography. The result indicates the degradation rate of ammonia is increased with the increase in Pt content on titania. With the optimization of reaction parameters, total ammonia could be completely converted to the less toxic component, nitrate.

The designed catalyst was immobilized on a porous supports as practical filter. The deactivation phenomenon of this filter was observed after long-time reaction. This filter was further applied in an fish bowl containing 8 Cardinal tetra to evaluate the photocatalytic activity for ammonia degradation.

The result from fish bowl indicates the generation rate of ammonia is suppressed with using this photocatalytic system. Even though the fish bowl equipped photocatalytic system was two times the amount of fish in the control one, the

concentration of ammonia in the photocatalytic fish bowl was still lower than that in control one. The increase in the nitrate concentration in the photocatalytic fish bowl resulted from the photocatalytic degradation of ammonia over the prepared filter, meanwhile, the survival rate is also improved.

Keywords : Pt/TiO₂, ammonia, photocatalytic degradation