The effect of calcination atmosphere on photocatalytic activity of water-dispersible g-C_3N_4 photocatalysts

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Bulk graphitic carbon nitride (g-C_3N_4) photocatalysts were synthesized by thermal polycondensation of thiourea at different gaseous atmospheres (air, N_2 and CO_2). Water-dispersible g-C_3N_4 photocatalysts were prepared from bulk g-C_3N_4 by a chemical oxidation method. The morphological texture, polymeric structure, porosity, charge carrier behavior and light absorption of the materials were thoroughly investigated. Furthermore, their photocatalytic activity was evaluated by degradation of methylene blue under visible light irradiation. The results showed that the structural and optical properties highly depend on gaseous atmosphere. The best photocatalytic activity was exhibited by the sample prepared in CO_2 atmosphere with chemical oxidation treatment (CTw) and the possible reasons were discussed. Detailed characterizations indicated that the CO_2 calcination atmosphere induced less nitrogen, more NH_x groups, and faster rate of the electron transport between heptazine rings for CTw among samples. Water dispersible g-C_3N_4 showed higher photocatalytic degradation rate of methylene blue than bulk due to the improvement of specific surface area and absorption ability.