

Materials Science & Engineering Thesis Defense

Selenate and Chromate Removal with Titanium Dioxide based Photocatalysts

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abstract

As selenium and chromium are toxic even at low levels, it is necessary to remove them from drinking water with proper ways. In this work, titanium dioxide based photocatalysts were mainly investigated in detail for their ability to remove selenate and chromate in aqueous environments using photoreduction. Firstly, photoreduction ability of layered double hydroxide (LDH) nanosheets with commercial TiO₂ particle hybrid materials was investigated for selenate or chromate removal. The results showed that commercial LDH/TiO₂ (P90) composite, homemade LDH nanosheets/TiO₂ (P90) composite and also in situ LDH/TiO₂ (P25) composite all did not indicate significant improvement on photoreduction performance towards selenate or chromate. Secondly, TiO₂ nanosheets material was synthesized with TiS₂ as precursor via hydrothermal treatment. Morphology of TiO₂ nanosheets were characterized by SEM, AFM and TEM. Photodegradation of MB (methylene blue) with TiO₂ nanosheets was performed. In the future, first approach is to synthesize visible-light driven LDH photocatalyst NiFe-LDH nanosheets with TiO₂ nanosheets hybrid material for selenate removal. Second approach is to use anion intercalation/insertion via electrochemical process to remove anions in drinking water.