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UV–Vis photocatalytic performance of the S-doped TiO2 and TiO2 thin films for water treatment

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TiO2 films have been widely used as catalysts in oxidative processes in order to degrade organic contaminant. However, without the presence of a dopant material, its photocatalytic activity is limited only in the region of ultraviolet radiation (UV), due to its high-energy band gap. In this present research, anatase TiO2 thin films were grown on borosilicate substrates by metalorganic chemical vapor deposition (MOCVD) at 400ºC. To make the semiconductor active in the visible light region, sulfur doped TiO2 films were prepared by means of a thermochemical treatment carried out in a tubular oven, under atmosphere of H2S at 50ºC for 60 minutes. The films were characterized by XRD, AFM, FE-SEM and XPS technique. The photocatalytic behavior of the films was evaluated by methyl orange dye degradation under UV-Vis irradiation for 300 minutes. The photocatalytic tests were realized in a reactor illuminated by two tubular UV lamps (352 nm), and in a reactor illuminated by visible light (400-700 nm) on different intensities, both containing 40 mL of the dye solution. The results showed that the S-TiO2 films present promising photocatalytic efficiency. Without the presence of the catalyst, there was no degradation of the methyl orange dye under UV-Vis irradiation. Non-doped TiO2 films do not exhibited photocatalytic activity under visible light. It was possible to observe that the visible light intensity influences the doped films photocatalytic performance.