Elemental mercury removal from flue gas over TiO_2 catalyst in an internal-illuminated honeycomb photoreactor

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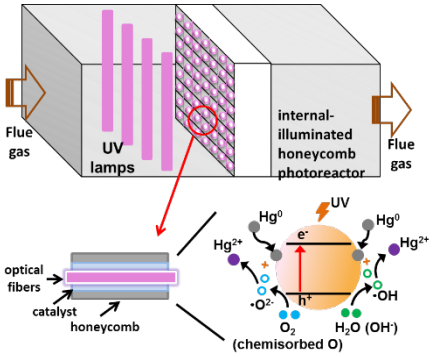
ABSTRACT. The removal of elemental mercury (Hg^0) from flue gas was performed by using TiO_2 catalyst in an internal-illuminated honeycomb photoreactor. The TiO_2 catalyst was prepared and coated on the surface of ceramic honeycombs. Effects of TiO_2 coating value, calcination temperature of catalysts, reaction temperature, UV-light intensity, and reactor type on Hg^0 photocatalytic oxidation performance were investigated. Under optimal operating condition, approximately 95% of Hg^0 removal efficiency was obtained. With the increase of TiO_2 coating value, the Hg^0 removal efficiency significantly increased. The catalyst calcined at 400 ℃ presented optimal Hg^0 removal performance. The higher calcination temperature resulted in the conversion of TiO_2 from anatase to rutile phase, which weaken the Hg^0 photocatalytic removal activity. Similar Hg^0 removal performances were obtained under UV irradiation when the reaction temperature was in the range of 25-90 ℃, and 1.5 mW/cm^2

of UV light irradiation was competent for Hg^0 photocatalytic removal. With the same quantity utilization of TiO_2 catalyst, the internal-illuminated honeycomb photoreactor presented better Hg^0 removal performance than fixed-bed reactor. Finally, the procedure of Hg removal from flue gas over TiO_2 catalyst in internal-illuminated honeycomb photoreactor was proposed, and the product in the Hg^0 photocatalytic removal process was analyzed as well.

KEYWORDS. mercury, photocatalytic removal, TiO_2, photoreactor, coal combustion



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