Environmental Engineering and Management Journal, December 2003, Vol.2, No.4, 365-376
http://omicron.ch.tuiasi.ro/EEMJ/

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REGENERABLE ZINC TITANATE SORBENTS FOR HOT-GAS DESULFURIZATION PROCESS

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Abstract

Hot-Gas Desulfurization (HGD) is the main process for hydrogen sulphide removal from gases at high temperature. Higher efficiency and lower cost are achived by using zinc oxide based sorbents as they can effectively reduce the H_2S content in gases to ppm levels and can be regenerated for multicycle operation. Zinc titanate sorbents, a mixed-metal oxide prepared by combining ZnO and TiO_2 at high temperature, is currently one of the leading sorbents for HGD process. In desulphurizing process, titanium oxide prevent ZnO reduction to volatile metallic zinc. Depending on the ZnO:TiO_2 molar ratio and the preparation and calcination conditions, several phases of zinc titanate (Zn_2TiO_4, $ZnTiO_3$ or $Zn_2Ti_3O_8$) can be formed. By calcination at 700-720 ^{0}C for 4 hours of mixed oxides with ZnO:TiO_2 molar ratio 2:1, only Zn_2TiO_4 are formed with 90-95% efficiency. For mixtures with excess of TiO_2 (ZnO:TiO_2 molar ratio 1:1 and 2:3) on similary conditions, Zn_2TiO_4 and $Zn_2Ti_3O_8$ in different molar ratio are formed. Regeneration of sulphuretted zinc titanate sorbents is strongly influenced by the temperature, a complete regeneration with high rate of the oxidation reaction being possible at 600-700 ^{0}C temperature range. The titanium oxide excess from ZnO:TiO_2 $\leq$ 2:1 molar ratio titanates, prevent sorbent sintering or attrition and zinc sulphate formation, allowing a multiple desulphurizing-regeneration cycles.

Keywords: Hot-Gas Desulfurization, zinc titanate sorbents, regeneration

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