

Cobalt containing sorbents for removing elemental sulfur at low temperature

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Many efforts have been put in treating the low concentration of hydrogen sulfide from the Claus plants or other emission sources. Among the commercial desulfurization processes, the dry catalytic oxidation process is highlighted recently. H_2S is catalytically oxidized to elemental sulfur after hydrogenation of sulfur compounds to H_2S . It is reported that the low concentration of produced elemental sulfur can cause mechanical problems. In order to make up for the operational limitation of previous condenser, this research proposes the chemical absorption process and proper sorbents.

The absorbent Co_9S_8 reacted with sulfur vapor to yield CoS_2 at $350\sim 400^\circ C$. The absorbents can be regenerated using hydrogen at the same temperature. When Co_9S_8 was loaded on Al_2O_3 , the sorbent can be regenerated for over 5 cycles. For the supported cobalt sulfide absorbent, the sulfur concentration and metal loadings didn't affect on the reactivity above $350^\circ C$. The sulfur diffusion rate controlled the overall reaction rate. The supported cobalt sorbents, which have a high surface area and smaller particle size, showed high performance in the sulfur absorption reaction.