Equilibrium Approach examining Sulfur Tolerance of V_2O_5/Al_2O_3 Catalyst for NO Reduction by NH_3

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The deactivation of V_2O_5/Al_2O_3 catalyst by SO_2 for NO removal by NH_3 has been examined using the concept of capillary condensation of ammonium bisulfate and aluminum sulfate, the primary deactivating agent at 250 and 400℃ of the reaction temperature, respectively, accumulated on the surface of the catalysts containing a variety of pore structure. The deactivation levels off for the catalyst containing the certain size of the pore where the deactivation agent, mainly sulfur compound fills, blocks and/or plugs by the concept of capillary condensation. It strongly depends on the size of the mean pore diameter of the catalyst, since the agent mainly forms in an equilibrium process among SO_2, NH_3 and the component of the catalyst for SCR reaction system. The smaller pore will be immediately blocked, while the larger pore is still accessible for the reaction. The catalyst containing the large pore never completely loses its catalytic activity. Of course, the present approach may only be valid for the catalyst deactivation mainly caused by pore filling, blocking and/or plugging. The catalyst deactivation can be controlled, if the size of the catalyst pore were appropriate. Furthermore, the life of the catalyst may even be predicted by the present approach.