

The treatment of VOCs by combination of adsorption and complete oxidation using oxide catalysts on supports

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Volatile organic compounds (VOCs) have negative impacts on environment as well as human health. Therefore, they should be converted into harmless substances before releasing in the atmosphere. Adsorption is the most common technology which have been applying in industry. Besides, catalytic oxidation is a promising and effective technique, which can apply for VOCs decomposition. Most of catalysts that have applied in industry are noble metal, but they are easy be deactivated by sintering or poisoning. Single metallic oxides on porous material also were used in adsorption as well as oxidation of VOCs. Recently, the bimetallic oxides are promising solutions to replace the noble metal catalysts, because of their stronger activity. The loading of bimetallic oxides on adsorbents improves their activities and the combination of adsorption and desorption-oxidation steps makes the process occur at lower temperature. In our work, cobalt – copper bimetallic oxide catalysts of on several adsorbents are studied for the adsorption and desorption-oxidation of toluene. The combination of Co and Cu oxides can produce a smaller particle sizes as well as enlarger metallic dispersion on adsorbents in comparison with single metal oxides, which is considered as the main reason for improving catalytic activity. The catalysts play two roles in the treatment of toluene: adsorb toluene at temperature below 300oC and oxidize adsorbed toluene at temperature over 300oC. The catalysts containing 3 wt%Co and 7 wt%Cu oxides on MCM 41 showed the best performance with the toluene conversion of 100% and 100% toluene decomposing into CO₂ at 400C.

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