

Alumina Supported Cu-Mn-Cr Catalysts for CO and VOCs oxidation

Authors : Krasimir Ivanov, Elitsa Kolentsova, Dimitar Dimitrov, Petya Petrova, Tatyana Tabakova

Abstract : This work studies the effect of chemical composition on the activity and selectivity of γ -alumina supported CuO/MnO₂/Cr₂O₃ catalysts toward deep oxidation of CO, dimethyl ether (DME) and methanol. The catalysts were prepared by impregnation of the support with an aqueous solution of copper nitrate, manganese nitrate and CrO₃ under different conditions. Thermal, XRD and TPR analysis were performed. The catalytic measurements of single compounds oxidation were carried out on continuous flow equipment with a four-channel isothermal stainless steel reactor. Flow-line equipment with an adiabatic reactor for simultaneous oxidation of all compounds under the conditions that mimic closely the industrial ones was used. The reactant and product gases were analyzed by means of on-line gas chromatographs. On the basis of XRD analysis it can be concluded that the active component of the mixed Cu-Mn-Cr/ γ -alumina catalysts consists of at least six compounds - CuO, Cr₂O₃, MnO₂, Cu_{1.5}Mn_{1.5}O₄, Cu_{1.5}Cr_{1.5}O₄ and CuCr₂O₄, depending on the Cu/Mn/Cr molar ratio. Chemical composition strongly influences catalytic properties, this influence being quite variable with regards to the different processes. The rate of CO oxidation rapidly decrease with increasing of chromium content in the active component while for the DME was observed the reverse trend. It was concluded that the best compromise are the catalysts with Cu/(Mn + Cr) molar ratio 1:5 and Mn/Cr molar ratio from 1:3 to 1:4.

Keywords : Cu-Mn-Cr oxide catalysts, volatile organic compounds, deep oxidation, dimethyl ether (DME)

Conference Title : ICCET 2015 : International Conference on Chemical Engineering and Technology

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2015