

RELATIONSHIP BETWEEN SURFACE STABILIZED  $\text{Cu}^+$  IN COPPER-  
CHROMIA CATALYSTS AND ACTIVITY FOR METHANOL FORMATION.

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Recent evidence suggests that in Cu-ZnO, the  $\text{Cu}^+$  species may be the component responsible for methanol formation. Copper-chromium oxide catalysts also have similar selectivity for methanol synthesis under reaction conditions like those used for Cu-ZnO catalysts. X-ray photoelectron spectroscopy and x-ray diffraction studies of the Cu-Cr oxide catalyst indicate that the activity for methanol formation is associated with a crystalline cuprous chromite phase. The concentration of surface  $\text{Cu}^+$  species, stable under  $\text{H}_2$  reduction or syngas reaction conditions, is correlated with the activity for methanol formation. Bulk stabilization of  $\text{CuCrO}_2$  ( $\text{Cu}^+$ ) appears to be responsible for the surface stabilized  $\text{Cu}^+$  species. The concentration of surface  $\text{Cu}^+$  is dependent upon the Cu/Cr ratio, the calcination temperature, and the nature of the catalyst pretreatment. Comparisons will be made between real and model catalysts. In addition the concentration of these  $\text{Cu}^+$  sites is independent of  $\text{CO}_2$  addition to the synthesis gas feedstream. The associated decrease in catalytic activity is attributed to the non-catalytic, competitive adsorption of  $\text{CO}_2$  on sites active for  $\text{CH}_3\text{OH}$  formation. These results for Cu-Cr oxide provide some interesting similarities and differences in comparison to the Cu-ZnO catalyst.