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# High-Pressure CO Adsorption on Cu-Based Catalysts: Zn-Induced Formation of Strongly Bound CO Monitored by ATR-IR Spectroscopy

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**ABSTRACT:** CO adsorption at 1 MPa on Cu−Zn stearate colloids and supported Cu catalysts was studied in situ by attenuated total reflection infrared (ATR-IR) spectroscopy. Subsequent to thorough reduction by $H_2$, the IR band at 2110−2070 $cm^{-1}$ due to linearly adsorbed CO on clean metallic Cu was always observed initially on all Cu catalysts. During the exposure of Zn-containing samples to CO at high pressure, a new IR band at ca. 1975 $cm^{-1}$ appeared in addition and increased in intensity even at room temperature. The detailed analysis of the IR spectra showed that the new IR band at ca. 1975 $cm^{-1}$ was not related to coadsorbed carbonate/formate-like species, but to the content of Zn in the samples. This IR band was found to be more stable than that at 2110−2070 $cm^{-1}$ during purging with inert gas. It disappeared quickly in synthetic air, pointing to a strongly reduced state of the Zn-containing Cu catalysts achieved during high-pressure CO exposure. It is suggested that CO can reduce ZnO to Zn in the presence of Cu, resulting in the formation of a $CuZn_x$ surface alloy. As the CO species with the characteristic IR band at ca. 1975 $cm^{-1}$ binds more strongly to this $CuZn_x$ alloy than the linearly adsorbed CO to pure Cu, it is suggested to be adsorbed on a bridge site.