(3) In reduced and used catalysts, we found a Cu-O coordination peak (R=0.190mm, N=1) in RFS. But another peak at R=0.196mm, belonging to Cu-O coordination in CuO, was not found in the same RFS. We consider that this is evidence of a strong interaction between metal and Cu-Al2O3.

(4) Because of γ-Al2O3, the reasons of deactivation are different for CZ and CZA. For CZ, deactivation is caused by enlargement and increase of crystalline Cu. For CZA, the γ-Al2O3 may prevent the enlargement of Cu crystals, and stabilize this way the activity of CZA. The reason of deactivation is the change of the dispersed Cu to the crystalline phase in the catalytic reaction, which leads to the loss of active regions.

XRD graphics and RFS figures are shown below.

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**Figure 1.** X-ray diffraction diagrams of the binary catalysts in the ternary catalyst 1. CuO 2. ZnO 3. Cu

**Figure 2.** Cu-EXAFS a. T-oxidized b. T-reduced c. T-aqueous a. B-reduced b. B-oxidized

**Figure 3.** (a) Electron diffraction photograph along the [001] zone axis, showing the diffuse scattering due to Ti cation network disorder. (b) The intersection of the diffuse scattering surface calculated with the model described in the text and the [001] reciprocal plane.

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