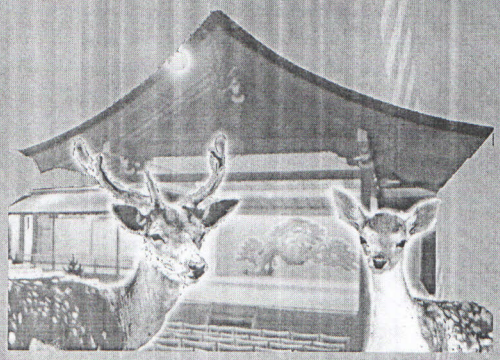

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P62 MoCrGa polyoxide catalysts in partial oxidation of propane-butane mixture

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It was shown that conversion of propane-butane mixture proceeds with the formation of gaseous and liquid products. Partial oxidation of propane-butane mixture with varying the catalytic mixture composition and the contact time yielded acetone, methyl ethyl ketone, methanol, acetaldehyde, croton aldehyde, butanol, and acetic acid, as well as C_2-C_3 unsaturated hydrocarbons. The investigation on influence of the nature of carrier on yield of acetone from reaction temperature was carried out. More high yields of acetone and acetaldehyde were produced over NWC in comparison with NRC. Mo, Cr and Ga samples have shown more optimal properties during investigation of the series of monometallic (Mo, Ce, Bi, Cr, Ga, Fe, Mn, Ni, Co and Zn) and bimetallic contacts supported over NWC catalysts. Investigation of 1, 5 and 10% MoCrGa/NWC has shown that 5% sample is active in forming of ketones (acetone, methyl ethyl ketone), 10% - acetaldehyde and 1% - ethylene. The yield of acetone was increased from 32% at 400°C to 50,9% at 550°C, W = 450 h^{-1}, C_3-C_4:O_2:N_2:Ar = 5:1:4:5 over 5% MoCrGa/NWC, yield of acetaldehyde – up to 41% at 450°C, W = 450 h^{-1}, C_3-C_4:O_2:N_2:Ar = 5:1:4:5 over 10% MoCrGa/NWC. Optimal space velocities for catalysts with different content of active phase over carriers were determined. Up to 23% of acetone and 35% of methyl ethyl ketone on 1% MoCrGa/NWC were produced at W = 1350 h^{-1}. Increase of content of acetone up to 31% in catalyzate was observed at reduction of propane-butane in reaction mixture. Dependence the yield of acetone from temperature at the different space velocity over 5% MoCrGa/NWC has shown on Figure 1. More high yields of acetone were obtained at W = 300-450h^{-1} and 350-550°C.

After processing at 623K in experimental conditions on the surface of MoCrGa/NWC catalyst spinel-like formation of $CrMoO_4$+CrO with 60 nm size of particles, Ga_2O_3 with various modification (α and φ), and Cr^{3+} particles were generated. Cr^{5+} and CrOOH phases have not been found. Aggregates from larger dense particles of Ga^{3+} and Cr^{3+} are observed. After processing at 823K there are new phase of $CrMoO_6$ in the size of 50 nm and Ga^{3+} particles. It is supposed, that these phases play a significant role in synthesis of acetone from propane-butane mixture.

The determination of the product composition showed that the process follows a complex mechanism including oxidation, oxidative dehydrogenation, and cracking. The optimal conditions for synthesis of products were detected:

- 50,9% of acetone was produced on 5% MoCrGa/NWC catalyst at 550°C and W = 450 h^{-1} in reaction mixture C_3-C_4:O_2:N_2:Ar = 5:1:4:5;
- 41,0% of acetaldehyde was produced on 10% MoCrGa/NWC catalyst at 450°C and W = 450 h^{-1} in reaction mixture C_3-C_4:O_2:N_2:Ar = 5:1:4:5.

This screening study aimed at searching for appropriate compositions and technological parameters of the oxidative conversion of propane-butane mixture show that the chosen line of research is promising and makes it possible to obtain good results in the synthesis of hydrocarbons and oxygenated compounds.

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