

On the Nature of Heterogeneous Catalysts for Selective Oxidation Reactions

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Selective oxidation reactions of organic molecules are usually carried out over multicomponent oxide systems. These systems offer only limited chances to understand the reaction mechanisms which transform atomic oxygen into a selective reagent.

Elemental silver was found to form at high temperatures and under elevated pressures a novel sub-surface oxygen phase which acts as Lewis-basic active site for de-hydrogenation of C-H bonds. This reaction is responsible for the stabilisation of silver against evaporation at 900 K under oxygen and contributes about 50% of the total technical activity in the methanol - to formaldehyde process. The geometric and electronic structure of the novel high-temperature phase will be described in relation to the conventional oxygen adsorbate and oxygen species dissolved in the bulk of silver metal.