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Selective catalytic reduction of NOx with ammonia – laboratory studies with the use of CuOx/Al2O3 catalysts

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Nitrogen oxides are among the most pervasive and difficult emissions to control. Currently, there are no commercial catalytic processes decomposing NOx without a reducing gas. Selective catalytic reduction (SCR) systems for NOx reduction use ammonia as the reducing agent. Ammonia SCR requires the handling of large quantities of toxic gases, tight temperature control, high reaction temperatures. Also effective NOx reduction requires large amount of catalyst because of the relatively low reaction rate. Lowering the cost of the reduction process by increase in the process efficiency and limiting the difficulty of handling the reducing agent would reduce the catalyst cost and decrease the operating temperature. Due to the above-mentioned arguments, the improvement of NOx reduction with ammonia SCR is important. It is also important because of the biomass use intensification (mainly due to the fact, that it is renewable energy source). Considering biomass chemical composition, NOx emission is much higher in the combustion processes comparing to the coal combustion.

The aim of this study was to analyze the activity of copper oxide supported in the SCR laboratory scale studies. 0.1; 0.2; 0.5; 1.0 and 2.0% of CuO was loaded on two types of aluminosilicates (G) and tested in laboratory 200 mm long flow reactor. The NOx reduction with ammonia SCR was tested at the temperature range of 100-500 oC. Gas composition before and after the reactor was analyzed at each measurement point. Each time the result of the gas composition analysis was averaged from a measurement lasting 1 minute. Gas flow rate was set at the level of 3 000 $cm^3 \cdot cm^{-3} \cdot h^{-1}$.

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