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On the kinetics of oxidation of ammonia and interactions with nitric oxide and sulfur dioxide.

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Ammonia has been used extensively for the selective non-catalytic reduction (SNCR) of nitric oxide (NO). This process efficiently reduces NO over a limited temperature range centered around 1200 to 1250 K. Experimental and kinetic modelling studies of SNCR are numerous. The presence of SO₂ may alter the SNCR process.

With increasing interest for ammonia as energy carrier or fuel, it is interesting to consider interactions between ammonia, nitric oxide and sulfur dioxide since they may play a role. under practical conditions where turbulence and recirculation favor the interaction between ammonia and nitrogen or sulfur.

We report results obtained in a jet-stirred reactor (JSR) at 1 bar for several equivalence ratios in the range 0.1 to 2, for several initial mole fractions of ammonia, sulfur dioxide and nitric oxide. Kinetic modelling of JSR experiments and burning velocities was performed and reaction pathway analyses were performed to interpret the results. The effect of SO₂ on the extent of NO reduction was controversial in the literature. We confirm that SO₂ does not lower the efficiency of the thermal de-NO_x process but shifts the optimal temperature to higher values through chain terminating processes ($H+H+M=H_2+M$) and radical pool reduction ($H+O_2+M=HO_2+M$) via the sequence of reactions $SO_2+H+M=>HOSO+M$, $HOSO+O_2=>HO_2+SO_2$, $HOSO+H=>SO_2+H_2$.

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