

NH₃ formation pathways from NO reduction by CO in the presence of water over Rh/Al₂O₃유천재[†]

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Steady-state kinetic measurements with varying NO (0.05–0.2 kPa), CO (0.2–0.5 kPa), and water (1.5–9 kPa) pressures at 598 K rationalize that N₂/N₂O selectivity is determined by NO pressure while the NH₃/(N₂O + N₂) selectivity is a single-valued function of NO/CO ratio. The existence of NCO* species on Al₂O₃ is confirmed by IR spectra. Monotonically increasing NH₃/Rh ratios from H₂O recirculation over the NCO* accrued in transient reaction studies on Rh/Al₂O₃ upon exposure to NO/CO mixtures suggests NH₃ formation occurs by hydrolysis of isocyanate species bound on Al₂O₃. These findings demonstrate the critical role of H₂O and NO/CO ratio in determining NH₃ selectivity for the operation of three-way automotive exhaust catalysts at rich air/fuel ratios.