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N₂O Formation in Selective Non-catalytic NO_x Reduction Processes

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Author(s)

Crisanto Mendoza-Covarrubias, Carlos E. Romero, Fernando Hernandez-Rosales, Hans Agarwal

ABSTRACT

Nitrous oxide is not an environmentally regulated species in the U.S., but it does participate in the stratospheric ozone chemistry and contributes to the greenhouse effect. Nitrous oxide has been found to be a by-product of the selective non-catalytic reduction process. Chemical kinetic calculations demonstrated that the formation of nitrous oxide in the urea-based selective non-catalytic reduction process is linked to the conversion of NO by cyano species released from the process parent compounds. This conversion occurs within in temperature window between 850 and 1050°C. With urea injection, nitrous oxide emissions represent up to 20 percent conversion of the NO_x reduced. The amount of nitrous oxide formed depends primarily on the process temperature, the amount of chemical injected, the initial NO_x level, and the carbon monoxide level in the gas stream. These observations, which were based on the chemical kinetics of the process, should be considered in designing selective non-catalytic reduction systems to minimize nitrous oxide by- product formation.

KEYWORDS

Selective Non-Catalytic Reduction Process, Nitrous Oxide Emissions Chemical Kinetics

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