

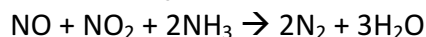
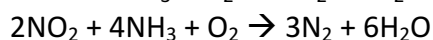
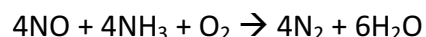
Which of the following chemicals is used to reduce the emission of NO_x in industrial processes?

- A. Lime (CaO) **B. NH₃** C. NaOH D. CaCO₃

NO_x is a general term that refers to all forms of nitrogen oxides that are pollutants in the air, out of which the two major pollution sources of the NO_x family are nitric oxide (NO) and nitrogen dioxide (NO₂). NO_x is formed from the reaction between nitrogen and oxygen during combustion of fuels including natural gas, coal, and biomass, and various sources contributing to NO_x emissions are identified to be vehicles, industries and atmospheric nitrogen.

NO_x is the major cause of smog formations and a main contributor to acid rain. Back in 1900s, the emission of NO_x was about 3000 kilotonnes per year, but this number has dropped significantly, with the emission of 1900 kilotonnes per year in 2014. The control and reduction in NO_x emission is the main reason for the decline, and the abatement technology has been commonly applied in industry and transportation nowadays.

Selective catalytic reduction and selective non-catalytic reduction are common methods used in NO_x reduction, in which ammonia or urea is injected to react with NO_x to form nitrogen and water. The process can be described by the following equations:



In the process of selective catalytic reduction, catalysts such as ceramic or titanium dioxide are used. In industrial combustion process, urea or ammonia is injected into the flue gas in the boiler where the reduction takes place, then the N₂ and H₂O that are generated are released as flue gas. This technology is also now used in transportation vehicles and ships.

Useful links

Seneque, M., Can, F., Duprez, D., & Courtois, X. (2016). NO_x Selective Catalytic Reduction (NO_x-SCR) by Urea: Evidence of the Reactivity of HNCO, Including a Specific Reaction Pathway for NO_x Reduction Involving NO+ NO₂. *ACS Catalysis*, 6(7), 4064-4067.

<http://pubs.acs.org/doi/abs/10.1021/acscatal.6b00785>

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<http://www.tandfonline.com/doi/full/10.1080/01919512.2015.1115335?src=recsys>

<https://www3.epa.gov/ttnecat1/dir1/fnoxdoc.pdf>