Nitrogen oxide

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Nitrogen oxide can refer to a binary compound of oxygen and nitrogen, or a mixture of such compounds:

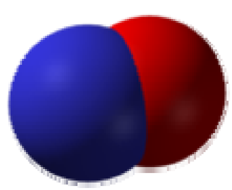
- Nitric oxide (NO), nitrogen(II) oxide
- Nitrogen dioxide (NO_2), nitrogen(IV) oxide
- Nitrous oxide (N_2O), nitrogen(I) oxide
- Nitrate radical (NO_3), nitrogen(VI) oxide
- Dinitrogen trioxide (N_2O_3), nitrogen(II,IV) oxide
- Dinitrogen tetroxide (N_2O_4), nitrogen(IV) oxide
- Dinitrogen pentoxide (N_2O_5), nitrogen(V) oxide

Contents

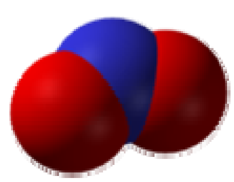
In atmospheric chemistry and air pollution and related fields, **nitrogen oxides** refers specifically to NO_x (NO and NO_2).[1][2]

Only the first three of these compounds can be isolated at room temperature. N_2O_3, N_2O_4, and N_2O_5 all decompose rapidly at room temperature. Nitrate radical is very reactive.

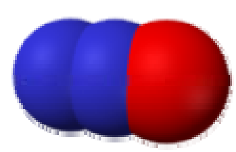
N_2O is stable and rather unreactive at room temperature, while NO and NO_2 are quite reactive but nevertheless quite stable when isolated.



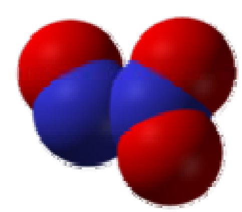
Nitric oxide, NO



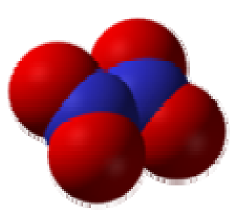
Nitrogen dioxide, NO_2



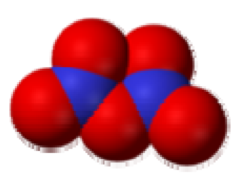
Nitrous oxide, N_2O



Dinitrogen trioxide, N_2O_3



Dinitrogen tetroxide, N_2O_4



Dinitrogen pentoxide, N_2O_5

NO_x

Main article: NOx

NO_x (often written NOx) refers to NO and NO_2. They are produced during combustion, especially at high temperature. These two chemicals are important trace species in Earth's atmosphere. In the troposphere, during daylight, NO reacts with partly oxidized organic species (or the peroxy radical) to form NO_2, which is then photolyzed by sunlight to reform NO:

$NO + CH_3O_2 \rightarrow NO_2 + CH_3O$
$NO_2 + \text{sunlight} \rightarrow NO + O$

The oxygen atom formed in the second reaction then goes on to form ozone; this series of reactions is the main source of tropospheric ozone. CH_3O_2 is just one example of many partly oxidized organic molecules that can react with NO to form NO_2.

These reactions are rather fast so NO and NO_2 cycle, but the sum of their concentration ([NO] + [NO_2]) tends to remain fairly constant. Because of this cycling, it is convenient to think of the two chemicals as a group; hence the term NO_x.

In addition to acting as a main precursor for tropospheric ozone, NO_x is also harmful to human health in its own right.

Derivatives

See also: Birkeland–Eyde process

Oxidized (cationic) and reduced (anionic) derivatives of many of these oxides exist: nitrite (NO_2^-), nitrate (NO_3^-), nitronium (NO_2^+), and nitrosonium (NO^+). NO_2 is intermediate between nitrite and nitronium:

$NO_2^+ + e^- \rightarrow NO_2$
$NO_2 + e^- \rightarrow NO_2^-$

See also

- Nitrogen oxide sensor

References

1. ^ United States Clean Air Act, 42 U.S.C. § 7602 (http://www.law.cornell.edu/uscode/42/7602.html)
2. ^ Seinfeld, John H.; Pandis, Spyros N., *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, Wiley-Interscience, ISBN 0471178160