$$NO^+ + e \begin{cases} \nearrow N(^4S) + O(^3P) \\ \searrow N(^2D) + O(^3P) \end{cases}$$

are nitrogen atoms in the ^4S and/or ^2D configuration and ground state oxygen atoms.

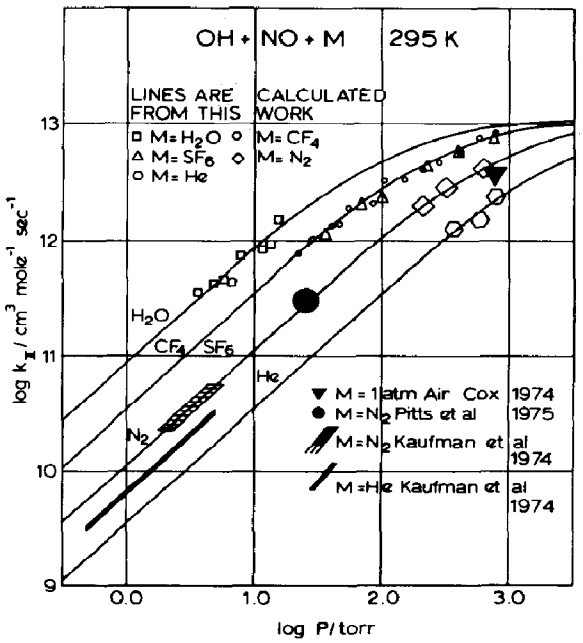
The knowledge of the $N(^2D)$ branching ratio is essential for the understanding of the ionospheric nitric oxide balance.

1 D. Kley, F. Stuhl and K. H. Welge, Z. Naturforschg., 18a (1963) 906.

V8
Hydroxyl Radical Combination with Nitric Oxide.
$OH + NO + M \longrightarrow HONO + M$

CATHY BLACK, RALPH OVEREND and GEORGE PARASKEVOPOULOS
Division of Chemistry, National Research Council Canada, Ottawa K1A OR9 (Canada)

The technique of flash photolysis of water vapour to produce hydroxyl radicals, couplet with resonance absorption ($OH^2\Sigma^+ \leftarrow X^2\Pi$ transition) detection of the transient hydroxyl decay has been used to study the reaction of hydroxyl with nitric oxide at 295 K. The reaction is termolecular and over the pressure range 50 - 760 Torr, changes from 3rd order to 2nd order kinetics.



Using gases assumed to be efficient third bodies (CF_4 and SF_6) the bimolecular reaction rate (k_Π) dependence on the pressure of M was followed. The results when plotted in the Lindemann Hinshelwood form

$$1/k_\Pi = 1/k_{\Pi\infty} + \text{const}/P$$

yielded good linear plots which by extrapolation gave $k_{\Pi\infty}$ at infinite pressure as $1.1 \pm 0.1\ 10^{13}$ cm^3 mole^{-1} s^{-1}. The experimental value is very close to the value $1.2\ 10^{13}$ cm^3 mole^{-1} s^{-1} predicted by Tsang (1973) from RRKM theory.

By suitable fitting of the data obtained for other gases as M the relative efficiencies (collision adjusted) are H_2O = 1.0, CF_4 = 0.41, SF_6 = 0.37, N_2 = 0.12, He = 0.02.

The fitted curves and the data obtained in this study are plotted on the attached figure. The points displayed for nitrogen and helium are those at high pressure. Data were obtained over the entire pressure range, but the lower pressures require adjustment for the effect of water vapour and are not shown.

The agreement between this work and that of different sources is also shown on the attached figure for nitrogen.

N.R.C.C. No. 14927

V9
Nitric Oxides in the Stratosphere -- A Two Dimensional Atmospheric Model

J. H. PARK
Physics Department, College of William & Mary, Williamsburg, Va. 23185 (U.S.A.)
and J.-F. LOUIS
NOAA, Boulder, Colo. 80302 (U.S.A.)

The global distribution of nitric oxides (NO_x = NO + NO_2) in the stratosphere (10 - 50 km) is investigated using an oxygen–hydrogen–nitrogen photochemical scheme and a parameterized two-dimensional transport model. The following assumptions are made to predict the distribution of NO_x: (1) The distribution of N_2O, which is assumed the main source of NO_x are not considered at this time. (2) The detailed treatment of the photodissociation processes in the O_2-Schuman-Runge band region, especially the NO photodissociation in the δ-bands,

is included in this study from the work by Park (1974). (3) The transport model includes the advection of species by the mean meridional circulation and the diffusion by eddy motions, adopted from the work by Louis (1974). (4) At the lower boundary (10 km) the value of the NO_x mixing ratio is assumed to be 4×10^{-9}. (5) The observed distributions of O_3 and H_2O are fixed in the model. The observed values of HNO_3 by Lazrus and Gandrud (1974) are also fixed because of the uncertainties in the HNO_3 chemistry and in its removal processes through rainout.

Despite the uncertainties which are partly listed above, the computed distributions of NO, NO_2 and N_2O (not shown here) are in good agreement with observations as shown in the figures. They are controlled by both chemistry and air motions; there is latitudinal as well as seasonal and vertical variation, and this demonstrates the importance of the horizontal transport of these species.

1 A. L. Lazrus, and B. W. Gandrud, Distribution of Stratospheric Nitric Acid Vapor, J. Atm. Sci., 31 (1974) 1102.
2 J.-F. Louis, Ph.D. Thesis, University of Colorado, Astrogeophysics Dept., 1974.
3 J. H. Park, The Equivalent Mean Absorption Cross Sections for the O_2-Schumann-Runge Bands: Application to the H_2O and NO Photodissociation Rates, J. Atmos. Sci., 31 (1974) 1893.