Reaction between NO3 and CH2O in Air. A Determination of the Rate Constant at 295 +/- 2K

Abstract:
The reaction between NO3 and CH2O was studied in a 450-L glass Teflon chamber using infrared FT-spectroscopy as the analytical technique. NO3 was obtained in equilibrium with N2O5 introduced from evaporation of the solid phase into the cell or generated in the cell itself by reacting NO2 with O3. Experiments were performed in both cases at 295 +/- 2 K and 740 Torr pressure in purified air. C13H2O was used to avoid spurious effects on the measured CO; C13O18 was introduced to estimate the OH radical concentration in the systems from the build-up of the oxidation product O16C13O18, C13H2O, C13O16, N2O5, HNO3, O3, NO2 and HCOOH. Time-dependent concentrations were measured and the data fitted on the basis of a model involving 31 reactions with the Facsimile Computer Programme. A rate constant for the reaction NO3 + CH2O equal to (5.4 +/- 1.1) x 10^-16 cm^3 molecule^-1 s^-1 at 295 +/- 2 K and Torr has been obtained. Significant differences have been found between the measured concentrations of OH and HCOOH with respect to those predicted by the model. In the frame of this study, the absolute strength of the V6 band of HCOOH (1045-1135 cm^-1) has been measured to be equal to (3.48 +/- 0.5) x 10^-17 cm molecule^-1.

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