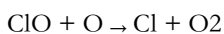
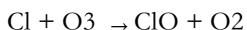


Abstract

The molecules CF_2Cl_2 and CFCl_3 are released into the atmosphere following their extensive use as propellants for aerosol spray cans and in refrigeration. Since they are chemically inert and have low solubility in water, these chlorofluoromethanes have very long atmospheric residence times and can be detected throughout the troposphere in amounts roughly corresponding to the integrated world industrial production to date. The most important sink for atmospheric CFCl_3 and CF_2Cl_2 appears to be photolytic dissociation in the stratosphere by ultraviolet radiation around 2000 \AA . Upon photolysis the chlorofluoromethanes release chlorine atoms, which initiate an extensive catalytic chain reaction



leading to the net destruction of O_3 in the stratosphere. This chain reaction can be diverted through reaction of ClO with NO , which interconnects the NO_x and ClO_x catalytic cycles. The Cl - ClO chain is interrupted by the reaction of Cl with methane or other hydrogenous species to form HCl , and it is renewed by reaction of OH with HCl . One-dimensional diffusion calculations show that present O_3 depletion levels resulting from the presence of the chlorofluoromethanes are of the order of 1%. This depletion would increase up to 15 or 20% if the chlorofluoromethane injection were to continue indefinitely at present rates. Furthermore, the calculations show that the full stratospheric effect of the photodissociation of CF_2Cl_2 and CFCl_3 is not immediately felt after their introduction at ground level because of the delay required for upward diffusion to the 25- to 30-km level. If the atmospheric injection of these compounds were to terminate only after causing an observable depletion of stratospheric ozone, the depletion would intensify for sometime thereafter and would remain significant for a period of a century or more.