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Rate coefficients calculated using BOLSIG and BOLSIG+

A rate coefficient is usually defined as $<Qv>$ where Q is the cross section, v is the speed and the brackets are used to indicate an average is over the distribution of electron speeds. Rate coefficients so defined are given directly by BOLSIG+.

The purpose of this note is make explicit the difference between rate coefficients calculated by BOLSIG+ and collision frequencies calculated by the older Boltzmann solver, BOLSIG. The collision frequencies coming from BOLSIG are expressed in units of s^{-1} $torr^{-1}$ and are equal to $F \times C \times <Qv>$ where F is the mole fraction of the target species and $C = 3.22 \times 10^{22}$ m^{-3} $torr^{-1}$ is a conversion factor between gas density and pressure taken at 300 K. So, to go from collision frequencies in BOLSIG to rate coefficients in BOLSIG+, divide by the mole fraction of the target species and then divide again by 3.22 x10^{22} to get a rate coefficient in m^3/s.