

Gas-phase Reactivity of CH₃OH and CH₃CH₂OH toward OH Radicals at Temperatures of Interstellar Dense Molecular Clouds (22 - 107 K)

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The interstellar medium (ISM) is a very complex environment in which more than 200 molecules have been detected. Many of these molecules are present in dense molecular clouds where the temperature ranges from 10 to 100 K. For example, hydroxyl (OH) radical was observed for the first time in Cas A,¹ and both methanol (CH₃OH) and ethanol (CH₃CH₂OH) were detected in Sgr B2.^{2,3} Astrochemical models are used to estimate the abundances of these species in the ISM. Rate coefficients (*k*) under the ISM conditions are needed to run and interpret these models, and traditionally, astrochemists have used (or extrapolated from) the known *k* at temperatures close to 298 K. However, some recent studies have found out that *k* at temperatures lower than 200 K are surprisingly higher than expected.⁴⁻⁶ Therefore, the aim of this work is to contribute to extend the kinetic database at ultra-low temperatures, needed for the models.

In particular, we will present a series of measurements of the rate coefficient *k* for the gas-phase reaction between OH radical and CH₃OH and CH₃CH₂OH. A new pulsed CRESU (*Cinétique de Réaction en Ecoulement Supersonique Uniforme*, that stands for Reaction Kinetics in Uniform Supersonic Flow) system has been used in order to generate a uniform supersonic flow at temperatures between 22 and 107 K.^{7,8} OH radicals were generated by pulsed laser photolysis of H₂O₂ at 248 nm and detected by laser induced fluorescence at ca. 308 nm. The temperature dependency of the determined rate coefficients will be discussed, as well as the pressure effect at 22 K between 3.37×10^{16} and 1.67×10^{17} cm⁻³.

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