"Experimental Studies on the Chemical Reactivity of Small Oxygenates towards OH radicals at the Ultra-Low temperatures in the Dense Molecular Clouds of the Interstellar Medium"

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Abstract

The interpretation of the observed abundances of >180 molecules (ions, radicals and molecules) detected in the interstellar medium (ISM) requires the knowledge of the rate coefficients (k) of all chemical reactions involved in their formation/depletion processes in the gas-phase. Astrochemists usually employ photochemical models where k of a great number of included reactions are not accurately known at the temperatures of dense molecular clouds of the ISM (10-100 K). For many radical-molecule reactions, those models consider the rate coefficient as an estimate or as the extrapolated value from high temperature data at ultra-low temperatures. Extrapolation procedure is not valid for most of the reactions of astrophysical interest, since it has been observed that the reaction rate of radical-molecule reactions is greatly enhanced (even several order of magnitude) at low temperatures. Here, we present the kinetic study of the gas-phase reaction of hydroxyl (OH) radicals with some oxygenated compounds at temperatures of the ISM by using a recently built pulsed CRESU apparatus. The pulsed laser photolysis technique is used to produce OH from H_2O_2 and the laser induced fluorescence technique is employed to monitor the time evolution of OH radicals. The astrophysical implications of the obtained results will be discussed.