METHANOL PHOTODISSOCIATION STUDIES USING MILLIMETER AND SUBMILLIMETER SPECTROSCOPY

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Many complex organic molecules (COMs) of prebiotic interest have been detected in interstellar environments, and new astronomical observatories such as ALMA and SOFIA are likely to extend our knowledge of the chemical composition of the universe. Astrochemical models suggest the formation of interstellar COMs is dominated by combination reactions between radicals on grain surfaces. These radicals are primarily produced from UV and cosmic-ray induced photodissociation. The various competing photodissociation pathways greatly contribute to the complexity of the reaction products, but in many cases the photodissociation branching ratios are not well-known. This is a particular challenge in ice photolysis studies, where the products are formed in a complex mixture in the condensed phase. Gas-phase spectroscopic studies offer a means to investigating photodissociation mechanisms in an environment where each product can be directly and separately monitored. To this end, we are developing a laboratory technique utilizing millimeter and submillimeter spectroscopy to directly observe photodissociation products and to quantify their branching ratios. We are focusing our first studies on methanol, which is predicted by astrochemical models to provide much of the starting material for COM chemistry in interstellar clouds. Here we will present our progress toward obtaining a quantitative description of the gas-phase methanol photodissociation mechanism.