USE OF WELL-DEFINED, SUPERTHERMAL BEAMS OF H- AND O-ATOMS TO STUDY RECOMBINATION ON GRAINS, A. Chutjian (ara.chutjian@jpl.nasa.gov) and O. J. Orient (otto.j.orient@jpl.nasa.gov), JPL/ Caltech, Pasadena, CA 91109.

Work presently being carried out of the chemistry and dynamics on astrophysical surfaces (grains, asteroids, etc.) involves the use of thermal atomic beams of energy less than about 0.1 eV. It is known that superthermal atoms exist in protostellar and protoplanetary fields, and in the interstellar medium. These atoms can arise through photodissociation, dissociative photoionization, electron-impact dissociation & dissociative ionization, and charge-exchange of stellar-wind species with a circumstellar neutral gas. At energies about 5 eV the atoms can now break bonds of surface-adsorbed species. Relative to thermal-energy beams, this will create new reaction channels, and alter the product mix of the surface reactions. We will describe work done at JPL in generating fast H- and O-atom beams. These beams have a well-defined energy (variable in the range 1.0-100 eV), energy spread (0.5 eV, FWHM), quantum state (only the ground state is produced), and beam purity (no admixed target or background gases)[1-4]. Proposed herein will be use of these superthermal beams to study fundamental reactions using, for example, an olivine surface. Reactions can be H + H(s) --> H2(g), H + CO --> HCO, H + H2CO --> CH2OH & CH3OH; O + CO --> CO2, O + CH4 --> CH3OH, etc. Species detection is through mass spectrometry using temperature-programmed desorption, and through FTIR measurements of the emission of vibrationally-excited products.
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