Water molecules in space: near-thresholds inelastic collisions of water isotopes.

Content

Water is the third most abundant molecule in the interstellar medium (ISM) and has ubiquitously been observed by ground- and space-based telescopes since its first detection in 1969 in the Orion nebula [1-3]. Thus water is a key molecule for the understanding of the energy balance and the physical-chemical processes that occur in these environments. Its principal collision partner obviously is H_2 because of its high abundance in ISM. Therefore, an accurate description of H_2O-H_2 collision dynamics is required at low temperature/energy, where the quantum nature of interaction may be revealed by the observation of resonances (Feshbach or shape/orbiting) [4].

The first rotational excitations of the water isotopologues by collisions with H_2 were observed in the near-cold regime in a crossed-molecular beam apparatus (CMB). The experimental scattering cross-sections were compared with the theoretical calculations performed on the potential energy surface of Valiron et al. [5], both at the state-to-state level and at low collision energy (near rotational thresholds) [6-7]. The different dynamical behaviors of **H_2O, D_2O and HOD**, colliding with ***normal*- or *para*-H_2** will be presented.

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