

Autodissociation of doubly charged water molecules

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Abstract

The electron impact dissociative double-ionization cross sections for H₂O between 45 and 1500 eV have been measured using time of flight mass spectrometry. The energy dependence of the H⁺+O H⁺ and H⁺+O⁺ ion pair production cross sections indicate that Auger-like autoionization following a vacancy in the 2a₁ molecular orbital is the main double ionization channel at high velocities. In contrast to expectation, these findings show that dissociation through the H₂O₂⁺ precursor state is a significant process at high collision energies. Knowledge of this process is vital as it has a direct affect on the production of important molecular species, such as H₂, during water radiolysis. Branching ratios of the various fragments produced following both autoionization and double ionization have also been obtained.

Indexed keywords

Double ionization channel; Molecular species; Water radiolysis

Engineering controlled terms: Charged particles; Dissociation; Hydrogen; Hydrogen peroxide; Ionization; Radiolysis; Water

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