

# Evaporation, fission and auto-dissociation of doubly charged water

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## Abstract

The paths and mechanisms leading to fragmentation of multiply charged molecules are still not well known. Multiply charged molecules can remain intact, or fragment via evaporation - eliminating light neutral atoms such as H<sup>0</sup> or via fission - ejecting one H<sup>+</sup>, or they can breaking up into two or more charged species [S.W.J. Scully, J.A. Wyer, V. Senthil, M.B. Shah, E.C. Montenegro, Phys. Rev. A 71 (2005) 030701(R)]. Small molecules, such as water and methane, are unstable after two or more electron removal. In this work we present experimental results of fragmentation of doubly charged water molecules by 30-1500 eV electrons. We show that, at low energies, doubly charged water essentially undergoes fission but, as the electron energy increases, the complete break-up of water becomes progressively dominant. The contribution to double ionization from auto-ionization [S.W.J. Scully, J.A. Wyer, V. Senthil, M.B. Shah, E.C. Montenegro, Phys. Rev. A 73 (2006) 040701(R)] of singly charged water molecules is discussed.

## Author keywords

Electron impact; Fragmentation; Ionization; Water

## Indexed keywords

**Engineering controlled terms:** Dissociation; Electrons; Evaporation; Fission reactions; Ionization

**Engineering uncontrolled terms:** Auto ionization; Charged water; Double ionization; Multiply charged molecules

**Engineering main heading:** Water