Abstract

In the present work, the results of the experimental study of reactions of ions with molecular hydrogen in the temperature range 15 – 300 K using a 22-pole ion trap apparatus are presented. The reaction of OD^- with para-enriched hydrogen was studied using a combination of the 22-pole ion trap apparatus with a para-hydrogen generator. Also reactions of O^- with H_2, D_2, and HD were studied. These reactions have a channel of water production and a channel of hydrogen or deuterium transfer. Another field of study was a sequence of reactions of oxygen hydride cations with H_2 and D_2 which leads to the production of H_3O^+ or its isotopic variant, specifically reactions OH^+ with H_2, H_2O^+ with H_2, D_2O^+ with H_2, and D_2O^+ with D_2. This reaction chain can be followed by the electron recombination of H_3O^+ or its isotopologue, which has a channel of water production.