Title: Recombination study of ions with electrons at temperatures below 300 K
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Abstract: Presented is the study of recombination of ions with electrons performed at low temperatures using the Flowing afterglow with Langmuir probe experimental technique. Studied was the dissociative recombination of \( \text{H}_3^+ \) and \( \text{D}_3^+ \) ions at temperatures 77 – 300 K. Apart from a two-body also a three-body recombination channel assisted by neutral He atoms was identified and studied. The obtained temperature dependence of the two-body recombination rate coefficient is in a good agreement with findings of other experimental and theoretical works. The dissociative recombination of \( \text{HCO}^+ \) and \( \text{DCO}^+ \) ions with electrons was studied in the temperature range 150 – 300 K. The observed temperature dependence of measured recombination rate coefficient for \( \text{HCO}^+ \) and \( \text{DCO}^+ \) ions (~\( T^{-1.3} \) and ~\( T^{-1.1} \), respectively) is in agreement with the majority of previous experimental works and evokes that indirect mechanism governs the recombination process. The electron-assisted collisional-radiative recombination of \( \text{Ar}^+ \) ions was for the first time studied at temperatures 50 – 300 K. The measured temperature dependence of the recombination rate coefficient ~\( T^{-4.5} \) corresponds with the value given by the theoretical works. For the measurements at cryogenic temperatures below 77 K a novel FALP-type apparatus was developed and constructed – Cryo-FALP II.

Keywords: dissociative recombination, collisional-radiative recombination, FALP, \( \text{H}_3^+ \), \( \text{HCO}^+ \)