AU Djuric, N, Dunn, GH, Al-Khalili, A, Derkatch, AM, Neau, A, Rosen, S, Shi, W, Vikor, L, Zong, W, Larsson, M, Le Padellec, A, Danared, H, af Ugglas, M
TI Resonant ion-pair formation and dissociative recombination in electron collisions with ground-state HF+ ions
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AB Rate coefficients and absolute cross sections for center-of-mass energies between 0.0001 and 1 eV are reported for both resonant ion-pair formation and dissociative recombination in electron collisions with HF+ ions. The heavy-ion storage ring CRYRING in Stockholm was used for these measurements. Notable is the fact that the dissociative recombination cross section is substantially smaller than that for most diatomic molecular ions. The recombination seems to have an underlying E-1 energy dependence characteristic of the direct process in dissociative recombination, but both cross sections show structure, which may be attributed to contributions from different indirect processes. The cross sections have no observable energy thresholds. The ratio of the cross section for resonant ion-pair formation to that for dissociative recombination is about 0.25 at 10(-3) eV, with the ratio depending on the interaction energy, so the competition of the ion-pair process is much stronger than for other ions so far studied. The HF+ ion is unique in the fact that the electron affinity of F, the binding energy of HF+, and energy of the atom pair [H(n = 2) + F(P-2(3/2))] are the same within the rotational-energy spread of the HF+ target. The resonant ion-pair formation process, e + HF+ --> H+ + F-, has some similarities to the photon process, hv + HF --> H+ + F-, and we discuss comparisons. We deduce thermal rate coefficients from our measurements and discuss them in the context of rate coefficients for other diatomic ions available in the literature.
C1 Univ Colorado, JILA, Boulder, CO 80309 USA., Natl Inst Stand & Technol, Boulder, CO 80309 USA., Univ Stockholm, Dept Phys, S-11385 Stockholm, Sweden., Univ Toulouse 3, LCAR, UMR 5589, F-31062 Toulouse 4, France., Stockholm Univ, Manne Siegbahn Lab, S-10405 Stockholm, Sweden.
RP Djuric, N, Univ Colorado, JILA, Boulder, CO 80309 USA.
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