The quasi-molecular absorption bands caused by the non-symmetric ion-atom radiative processes in alkali plasmas

V. A. Srećković[1], Lj. M. Ignjatović[1], M. S. Dimitrijević[2], N. N. Bezuglov[3] and A. N. Klyucharev[3]

[1] Institute of Physics Belgrade, Pregrevica 118, 11080, Belgrade, Serbia vlada@ipb.ac.rs

[2] Astronomical Observatory, Volgina 7, Belgrade, Serbia; mdimitrijevic@aob.rs

[3] Saint Petersburg State University, St. Petersburg State University, Russia

The processes: of absorption charge-exchange (free-free), photo-association (free-bound) collisions together with the processes of photo-dissociation (bound-free) in the case of symmetric and strongly non-symmetric ion-atom systems, are investigated. Here X is a K-potassium atom whose ionization potential is less than the corresponding value for atom A=H. AX^+ is molecular-ion HK+ in the ground electronic state and $(HK^+)^*$ molecular-ion in the first excited electronic state.

$$h\nu + AX^+ \Longleftrightarrow A^+ + X,$$

$$h\nu + A + X^+ \Longleftrightarrow A^+ + X.$$

$$h\nu + A + X^+ \Longleftrightarrow (AX^+)^*,$$

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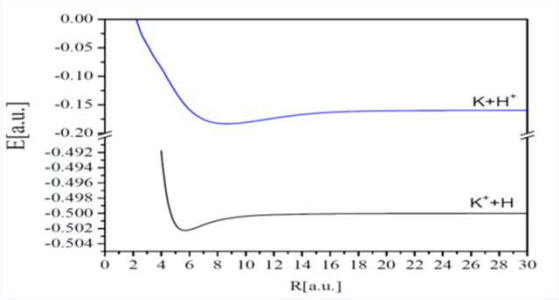
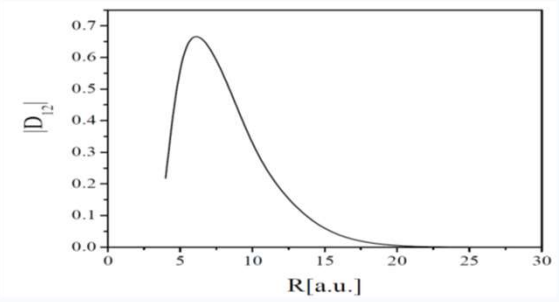
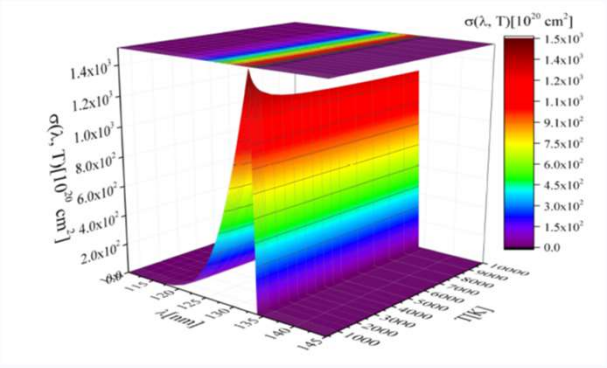




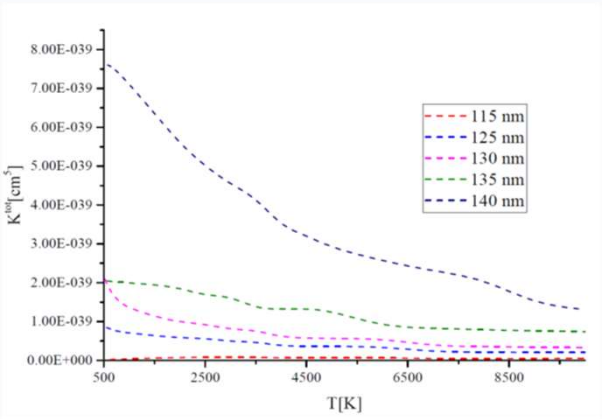
Data: to get needed theoretical information of the molecular spectra and pressure broadened atomic line profiles, the accurate molecular potential curves and transition dipole moments are needs, as well as a accurate theoretical simulation method. The values of these quantities i.e. the potential curves of the initial and final electronic states of the considered ion–atom systems are presented in Figures 1 and 2.

Also, we present the average cross-section for the (bf) ion-atom radiative processes.



We determined the corresponding spectral rate coefficient for the ion-atom radiative processes.

$$K^{(tot)}(\lambda,T) = K^{(bf)}(\lambda,T) + K^{(ff)}(\lambda,T) + K^{(fb)}(\lambda,T).$$



Modeling: the rate coefficient for the presented plasma parameters could be of important for the models of solar photosphere. Moreover, the calculated rate coefficient for the presented plasma parameters could be of interest in modeling geo-cosmical plasmas and also for the models of Io's atmosphere. Also for analysis of the data of the future space mission for the investigations of chemical composition and thermal structures of exoplanets ARIEL.