Electron capture by the exited hydrogen atom in the dense semiclassical partially ionized plasma

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The elementary processes in plasma have received considerable attention in many areas of physics such as astrophysics, atmospheric science, atomic physics, molecular physics, plasma physics, and surface sciences since the excitation and ionization of atoms and molecules have provided useful structural information on the collision systems as well as the physical information on environments of the collision systems. Especially, the electron-impact excitation of atoms in plasmas has been of a great interest since the emission spectra related to the excited atomic states would provide the useful information on plasma parameters, such as plasma density and temperature. Recently, the physical characteristics and properties of quantum plasmas have been extensively explored since the dense quantum plasmas are ubiquitous and have been found in nano-scale objects in modern science and technology, such as nano-devices, nano-wires, quantum dots, and semiconductor devices as well as astrophysical compact objects. One of the elementary processes in plasma is the electron capture process. In this work, the electron capture processes by the exited hydrogen atom was investigated. Here we took into account the polarization of the exited atom in different quantum-mechanical states. The motion of the electron in the field of the motionless atom was considered on the basis of the perturbation theory and the solving of the equation of motion. The interaction potentials between the electron and the hydrogen atom, taking into account the quantum-mechanical effect of diffraction and plasma screening effects, were presented in works [1-4]. In this work, the electron capture radius, which was determined by equating the kinetic energy of impacting electron and the interaction energy between the electron and the hydrogen atom, was presented. The trajectory of the electron in the field of the atom was simulated [4]. Using the electron capture probability, the electron capture cross section was calculated.

References

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