

Characterisation of ionisation mechanisms in Hydrogen atom.bare nuclei collisions in one dimension using the angle of revolution in phase space and molecular energy

Ionisation in the collisional systems $H+H^+$, $2eHH^{++}+3HLi^{++}$ and in one dimension has been studied, in detail, by solving the classical Hamilton's equations. Quantum nature of the electron is incorporated by a MonteCarlo technique. The dimensionality of the relevant phase space is reduced to two by driving the projectile through the target at constant velocity so that the behaviour of the trajectories in phase space could be studied carefully.

The existence of three types of ionisation mechanisms has been confirmed using the plots of trajectories in phase space. In mechanism type 1 the electron is scattered backwards with respect to the target. In type 2 it is trapped in between the two nuclei. In type 3 it is scattered forwards with respect to the projectile. Further characterisation of these mechanisms has been done using the angle of revolution in phase spaces, centred on the maximum of the potential and the on the projectile, and molecular energy of ionising trajectories at two relative nuclear velocities.

All the trajectories belonging to a particular mechanism at a particular relative nuclear velocity have the same asymptotic value, Θ , of the angle of revolution (θ) in the phase space except in mechanism type 2 where two values are obtained in the phase space centred on the maximum of the potential. of a particular (θ) mechanism at a given relative nuclear velocity is independent of the charge of the projectile. However, it depends on the relative nuclear velocity. An electron ionising through mechanism type 3 makes one full revolution about the projectile irrespective of the charge of the projectile and the relative nuclear velocity.

The existence of smooth curves of molecular energy versus inter.nuclear distance in all three collision systems has been demonstrated. A trajectory in mechanism type 2 always has a negative molecular energy at zero internuclear distance. An electron ionising through mechanisms type 1 and 3 always has a positive molecular energy at zero internuclear distance. This result is independent of the charge of the projectile.