EQUILIBRIUM CHARGE STATE DISTRIBUTIONS OF LOW-Z IONS INCIDENT ON THIN SELF-SUPPORTING FOILS

Abstract

by

Christopher J. Schmitt

Equilibrium charge fractions have been measured for 3 - 7 MeV lithium, boron, and carbon ions passing through thin carbon foils. The data are compared to the predictions of several semi-empirical models of equilibrium mean charge in the ≤ 1MeV/u regime. The current work underscores the general problem of extrapolating models developed for high-Z projectiles to ions of low-Z.

The charge fractions for the same ions have also been measured emerging from thin foils of carbon, aluminum, copper, silver, and gold. They are compared with the mean charge of the projectile, the functional form of the charge distribution, and the distribution width. These are parameters used to examine the effects on the projectile electronic structure for various target-projectile combinations. Projectile shell structure is found to have a significant influence on the widths of the charge state distribution. The data for these low-Z ions can be used to establish a baseline for more complicated electron systems encountered with ions of higher Z. Experimental techniques and comments on the nature of the equilibrium charge states of low-Z ions are presented.