SATURATION EFFECT IN *K*-SHELL EXCITATION OF HIGHLY CHARGED IONS AT INTERMEDIATE IMPACT VELOCITIES

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A variational impact parameter approach[1,2], based on the Schwinger principle, is used to investigate the saturation effect in the excitation cross sections of highly charged ions by bare nuclei at intermediate impact velocities, when the projectile charge increases. Contribution of intermediate states of the target, which were partially ignored in previous applications, are taken into account. This feature is illustrated by the good agreement between our theoretical calculations and experimental results[3] of excitation cross sections into 2p final states of helium-like Ar^{16+} ($1s^2$) impinging at an impact velocity of 23 a.u on various gaseous target, with nuclear charges ranging from 2 (He) to 56 (Xe). A range from the perturbative regime to the strong interaction regime has been investigated.

In these studied systems, it is interesting to see that the present results show that the variational formulation remains valid even in the strong interaction regime, where the coupling between the ionization and excitation channels becomes important when the target nuclear charge increases. We note that the addition of another intermediate states improves the saturation effect.

In the light of the comparison of our theoretical results with the Symmetric Eikonal Continuum Distorted Wave (SECDW) method[4] and molecular close-coupling calculations[5], saturation effect in the excitation cross sections can be explained in terms of a dissipative mechanism arising through the coupling between the various channels.

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