Calculation of single Ionization fully differential cross section of hydrogen molecule using DWBA approach

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The charged particle impact ionization studies of fundamental atomic and molecular systems have been of great interest since the early days of quantum mechanics. Extensive theoretical and experimental investigations have been carried out to understand the electron impact single ionization (i. e. (e, 2e) processes) of various targets. [1-6]. Being able to provide the information about momentum vectors of both final state continuum electrons, the (e, 2e) processes are very important in understanding the dynamical behaviour of quantum mechanical systems and also provide the stringent tests of the theoretical models. Accurate cross sections for molecular target ionization by electron impact are very important for the understanding of the complex interactions involved in the process.

Most recently the (e, 2e) Fully differential cross section (FDCS) results have been reported in the low to intermediate incident energy ranges for relatively simple molecular systems [7-8]. We present in this communication the results of our calculation of (e, 2e) FDCS of hydrogen molecule. We calculate the FDCS in the Distorted Wave Born Approximation (DWBA) formalism in the framework of the Linear combination of atomic orbital (LCAO) approach in which the molecular wave functions are expressed as a sum of Slater type orbital (STO) for each atomic nucleus of hydrogen. We will apply this treatment to calculate the FDCS for variety of kinematic conditions and will discuss the salient features of the cross section for the hydrogen molecule.

References

[1] I. E. McCarthy and E. Weigold, Phys. Rep. C27 (1976) 275.
[2] A. Lahmam-Bennani, J. Phys. B: At. Mol. Opt. Phys. 24 (1991) 2401.
[3] F. W. Byron Jr and C. J. Joachain, Phys. Rep. 179 (1989) 211.
[4] W. Nakel and C. T. Whelan, Phys. Rep. 315 (1999) 409.
[5] I. Bray, Phys. Rev. Lett. 89 (2002) 273201.
[6] I. Bray, J. Phys. B 33 (2000) 581.
[7] D. S. Milne –Brownlie, S. J. Cavanaghn, B. Lohmann, C. Champion, P. A. Hervieux and J. Hanssen (2004) Phys. Rev. A 69 032701.
[8] A. J. Murray (2005) J. Phys. B 38 1999.

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