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Theoretical and experimental study of (e,2e) ionization of the CO_2 ($1\pi_g$) molecule at 250 eV

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Synopsis Triple differential cross sections (TDCSs) of the electron-impact ionization of carbon dioxide are measured in the coplanar asymmetric geometry, with incident electron energy value of 250eV, and ejected electron of 37eV. We will report the experimental results in comparison with the theoretical calculations of the M3DW and TCC (type 5) calculations.

Not only its importance in applied fields from astrophysics to plasma chemistry, but also being the main component in the atmospheres of Venus and Mars, Carbon dioxide is an important molecule and it is very desirable to have available sets of cross sections for this gas. On the other side, information on cross sections for ionization of such atmospheric molecules by electron impact is important both for understanding the basic processes of atomic collisions and controlling events in the ionosphere.

In recent years the two-center Coulomb continuum (TCC) model was extended to three-center targets like CO_2 for low equal energy sharing regime and also relatively higher incident energy asymmetric regime [1-4]. The molecular three body distorted wave (M3DW) model contains the post collision interaction (PCI) between scattered and ejected electrons to all orders of perturbation theory and the distorted wave Born approximations (DWBA) contains PCI only to first order. The M3DW and DWBA have yielded good with experiment for several different molecular targets. The aim of this work is to compare experimental and theoretical results for (e,2e) ionization of CO_2. For coplanar asymmetric kinematics, two outgoing electrons from the same ionization event are detected with specified kinetic energies and angles. The scattered electron was detected at three fixed angles (-10^0,-20^0,-30^0), while the ejected electron energy is fixed to 37 eV. The results are measured for ionization of the CO_2 ($1\pi_g$) orbital at an incident electron energy of 250 eV.

Figure 1 compares experimental results with the predictions of the DWBA, M3DW and TCC (type5) model. We will discuss the characteristics of the molecular results in combination with experiment and theory during the conference.

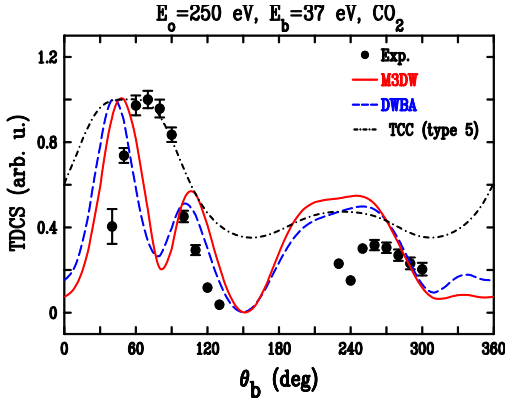

Figure 1. TDCS for CO_2 plotted as function of the ejection angle for the 37 eV ejected electron. The experimental results are compared to TCC, M3DW, and DWBA calculations.

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References

[1] O. Chuluunbaatar *and* B. Joulakian 2010 *J. Phys. B: At. Mol. Opt. Phys.* ***43*** **155201.**
[2] M.J. Hussey *and* A.J. Murray 2005 *J. Phys. B: At. Mol. Phys.* ***38*** **2965.**
[3] A. Lahmam-Bennani *et al* 2009 *J. Phys. B: At. Mol. Opt. Phys.* ***42*** **235205.**
[4] O Alwan *et al* 2014 *J. Phys. B: At. Mol. Opt. Phys.* ***47*** ***225201***

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