POLARIZATION OF LYMAN-α RADIATION FROM ATOMIC HYDROGEN EXCITED BY ELECTRON IMPACT FROM NEAR-THRESHOLD TO 1800eV

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We report new measurements for the polarization of Lyman-α radiation from the decay of atomic hydrogen excited by electron impact from near-threshold to 1800 cV. Atomic hydrogen is generated by an intense discharge source and a VUV monochromator provides accurate wavelength selection, a factor which is critical in quantifying the molecular contribution to the observed Lyman-α signal. Polarization is measured using a silica reflection linear polarization analyzer (with a high transmittance and polarizancc) mounted after the exit slit of the monochromator. Orientation of the monochromator is such that the plane defined by its entrance slit and optic axis is at 45° to the electron beam axis. This removes any polarization effects that may be induced by the monochromator and detector systems. The data we obtain correspond to the integrated Stokes parameter S_1 defined as

$$S_1 = [\, I(0°) - I(90°) \,] / [\, I(0°) + I(90°) \,]$$

where I (0°) and I (90°) are the photon intensities observed at 90° to the electron beam axis with electric vector parallel or perpendicular to the beam, respectively.

Comparison with various theoretical calculations shows the present experimental results are in good agreement with theory over the entire range of electron impact energies and, in particular, are in excellent agreement with the convergent close coupling (CCC) calculations of Bubelev et al. (1 995) (see Figure 1). The present data are also compared with the previous experimental measurements of Ott et al. (1970) which were truncated at 700eV.

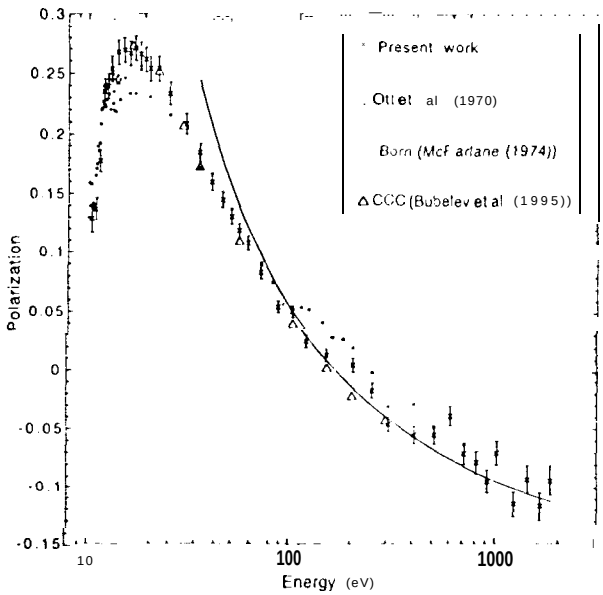

Figure 1. Experimental and theoretical H Lyman-α polarization data

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