3 - 5 Asymmetric Young's Double-slit Interference in Double Electron Capture by He $^{2+}$ from CO

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Various processes occurring in collisions of ions with molecules have been attracting much attention[1]. Of particular interests in such collisions are interference effects caused by coherent scattering/interaction of the ion on more than one atomic center[2,3]. The studies of ion-molecule collisions have been mainly restricted to homo-diatomic molecule (see Ref. [3] and references therein). In the present work, we study double electron capture in collisions between 30, 135 keV/u He^{2+} ions and CO molecules which are accompanied by breakup of CO^{2+} into C^+ and O^+ fragments. The Fig. 1 shows the distributions of the orientation angle θ of CO molecular axis in kinetic energy release (KER) range of 8.3∼9.0 eV.

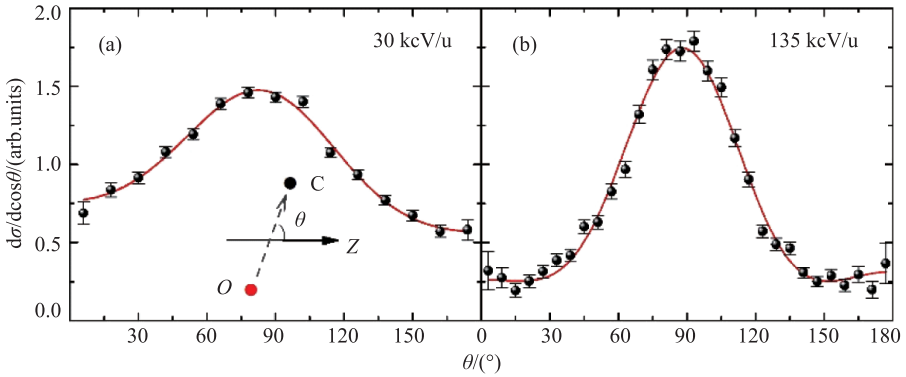

Fig. 1 (color online) Orientation distributions of CO molecular axis, *i.e.*, $d\sigma/dcos\theta$, when KER = 8.3∼9.0 eV. The He^{2+} incoming energies are 30 keV/u (a) and 135 keV/u (b), respectively. The solid curve is our fitted result.

In the figures, the orientation effects deriving from the projectile matter wave interference were observed. The interference in asymmetry diatomic molecule was found for the first time in the present work. The phase differences between the matter waves of the projectile scattering at CO atomic centers result in the asymmetry of the orientation distributions. As the projectile energy increasing, the phase difference decrease, and the orientation distribution is more symmetric.

References

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