COLLISION INDUCED DISSOCIATION AND DISSOCIATIVE CAPTURE OF SLOW H_2^+ AND HD^+ ON ATOMIC TARGETS

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Collision induced dissociation (CID) and dissociative capture (DC):

$H_2^+ + Ar\ (He) \rightarrow H^+ + H + Ar\ (He)$ (CID)

$H_2^+ + Ar\ (He) \rightarrow H + H + Ar^+(He^+)$ (DC)

are measured and separated by 3D momentum imaging of the fragments. CID is further separated into two mechanisms: electronic (eCID), and vibrational (vCID) excitation (marked by a and b, respectively, in Fig. 1A). These mechanisms are distinguished by the kinetic energy release (KER) and the momentum transfer to the center of mass of the projectile (p_{kick}). Similarly, DC is separated into capture directly to the repulsive $b^3\Sigma_u^+$ state and predissociating $c^3\Pi_u$ state (marked by d and c, respectively, in Fig. 1B).

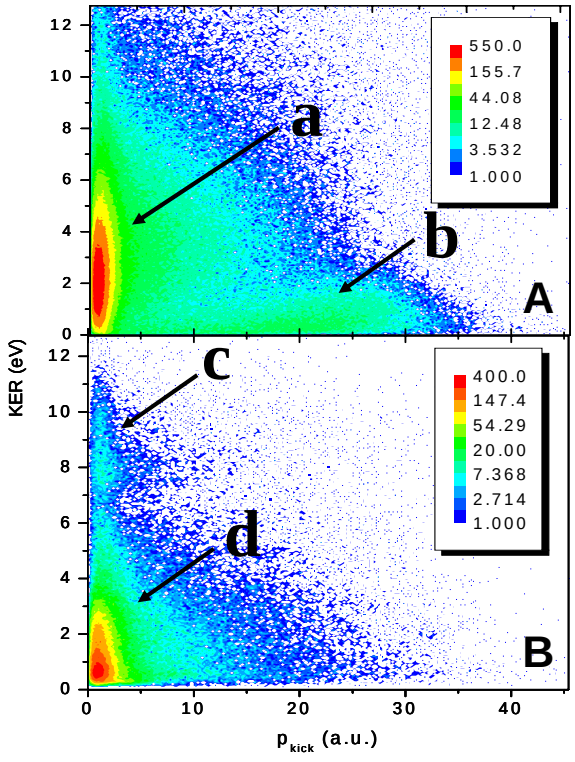

Fig. 1 KER vs. p_{kick} density plots of (A) CID and (B) DC for 3 keV H_2^+ on Ar.

Angular distributions for both channels show vCID strongly prefers to be aligned perpendicularly to the beam direction whereas eCID and DC prefer parallel alignment. We will compare our eCID data with theory and also report on isotopic effects in these processes for an HD^+ projectile.

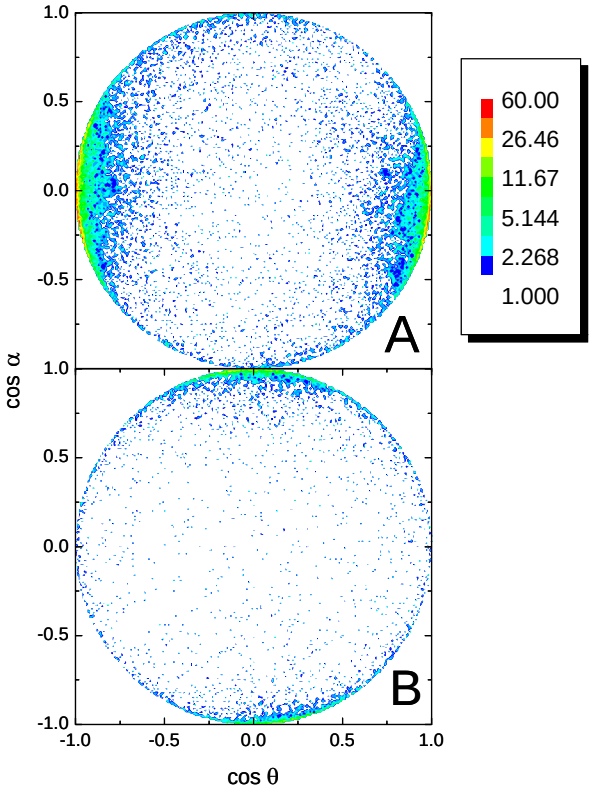

Fig. 2 cos α (where α is the angle between p_{kick} and the dissociation velocity) vs. cos θ (where θ is the angle between the dissociation velocity and the beam velocity) density plots of (A) vCID and (B) eCID for small impact parameter collisions (i.e. $p_{kick} > 3.5$ a.u.). The data indicate a clear angular preference.

Supported by the Chemical Sciences, Geosciences, and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U.S. Department of Energy.