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Trap losses in slow atom-molecule (He-OH) collisions[1] T.V. TSCHERBUL, ITAMP/CUA, Harvard/MIT, Z. PAVLOVIC, ITAMP/UCONN, Storrs, CT, H.R. SADEGHPOUR, ITAMP, Harvard-Smithsonian, R. COTE, UCONN Physics, Storrs, CT, A. DALGARNO, ITAMP, Harvard-Smithsonian, ITAMP/UCONN COLLABORATION — We present a theoretical analysis of molecular trap loss induced by collisions with slow atomic beams in external fields. The theory explicitly accounts for the effects of non-uniform trapping fields on collision dynamics by analyzing the kinetic energy of collision products in the lab frame. The cross sections for trap loss in collisions of OH($J = 3/2, M = 3/2, f$) molecules with ^{4}He atoms in a beam are sensitive to the lab-frame beam orientation. We find that when the beam kinetic energy is comparable to the gas thermal energy, the OH trap loss is mainly dominated by inelastic collisions. In this regime, increasing the trap depth suppresses both elastic and inelastic collisions to a comparable extent. In contrast, when the beam energy is large, the total cross section for trap loss is dominated by elastic scattering. The elastic contribution decreases with increasing trap depth due to small-angle quantum diffractive collisions, whereas the inelastic contribution shows no significant variations. Our results indicate that varying the trap depth in cold beam-gas collision experiments might be used to manipulate inelastic collisions and probe the angular dependence of atom-molecule scattering.

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