Abstract Submitted
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GEC Student Award for Excellence Finalist: Fluorescence Polarization of H_2, D_2, and N_2 Molecules Excited by Polarized Electron Impact[1] J.W. MASEBERG, T.J. GAY, University of Nebraska — We report relative Stokes parameters for both molecular and dissociated atomic transitions in H_2, D_2, and N_2 excited by spin-polarized electrons. In the case of molecular transitions, we find that values of the normalized circular polarization fraction, P_3/P_e, for light emitted in the direction of electron spin polarization are non-zero for H_2 and D_2, but consistent with zero for N_2. Specifically, we have succeeded in rotationally isolating the $H_2\, d\,^3\Pi_u \rightarrow a\,^3\Sigma_g^+ Q(1)$ 601.8 nm transition. It exhibits relatively large near-threshold values for P_3/P_e ($\sim$17%). This is in contrast to the null measurements for the $N_2\, C\,^3\Pi_u \rightarrow B\,^3\Pi_g$ 380.5 nm and $N_2^+\, B\,^2\Sigma_u^+ \rightarrow X\,^2\Sigma_g^+$ 391.4 nm transitions. For the case of fluorescence from dissociated atomic fragments we observe non-zero circular polarization values for H, D, and N. The near-threshold P_3/P_e values observed for the Balmer-alpha H and D 656.3 nm transitions are nearly equivalent ($\sim$8%). For the $N\,(^3P)3p \rightarrow (^3P)3s$ 824.2 nm transition we find P_3/P_e values of approximately -7%. This surprising negative sign indicates that the atomic fragment is spinning the "wrong way," i.e. in a direction opposite that of the incident electron responsible for the molecular dissociation.

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