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H_2 enhanced radiative grain alignment in IC63/IC59

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The alignment of interstellar dust grains with the magnetic field gives rise to polarization of both the light from background stars and the thermal dust emission. Over the last decade a comprehensive theory for interstellar grain alignment has been developed and observationally tested. With the advent of this quantitative theory, the polarization can be used to probe the magnetic field and the dust, gas and radiation field characteristics of the region. This "Radiative Alignment Torque" (RAT) theory predicts that molecular hydrogen formation on the surfaces of dust grains should enhance the grain alignment by providing additional torques on the grains. We have observed this effect in the reflection nebulae/Photo-dissociation regions (PDR) IC 63 (Andersson et al. 2013) and performed detailed *ab initio* modeling of the region (Hoang et al. 2015). Here we will review the results from both the IC 63 and IC 59 PDRs and discuss the uses of the combination of polarimetry, H_2 fluorescence, multi-band polarimetry and far-infrared photometry to provide unique probes of the physics of PDRs.

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