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POLARIZATION OF THE TAURUS INFRARED SOURCE

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ABSTRACT

Very high intrinsic polarization of the Taurus infrared source has been found. This observation confirms and extends the work of Zappala on late-type variable stars that are significantly but not as strongly polarized. If this polarization arises from particle alignment close to the star, then the self-reddening of the object must be appreciable.

Prompted by the confirmation of intrinsic polarization of the light of the late-type variables (Serkowski 1966; Zappala 1967) and the discussion of Wing, Spinrad, and Kuhi (1967) of the intrinsically cool nature of the Taurus infrared source (Neugebauer, Martz, and Leighton 1965), we have polarimetrically observed the Taurus infrared source on the night of March 13, 1967, with the Otto Struve reflector at the McDonald Observatory. In a V-filter band pass, a polarization of $p = 0.26 \pm 0.08$ mag and $\theta = 169° \pm 9°$ was found. The very high error is due to poor observing conditions and the faintness of the object (approximately $V = 15.5$ at the time of the observations). However, since the observed polarization is more than three times the statistical mean error, there seems to be little doubt that the object is highly polarized.

Only little interstellar polarization is expected at such high galactic latitudes ($b^{II} = 31°$). Most of the observed polarization is therefore probably formed in or close to the atmosphere of the star. Serkowski's (1966) observations indicate that there is a sharp increase in polarization with decreasing wavelength in late-type stars. If this is also true for the Taurus object, then these observations are consistent with the lack of appreciable infrared polarization in the study of Forbes (1967) at infrared wavelengths. The Cygnus infrared source studied by Forbes is very heavily reddened, and the polarization reported by that author is probably interstellar in nature. The large intrinsic polarization of the Taurus object supports the generalization of Zappala of the frequency of occurrence of intrinsic polarization in very cool stars and the arguments of Wing *et al.* that the source is intrinsically very red and cool. The fact that the polarization is greater in the Taurus source than in Zappala's stars argues that more scattering particles are present and/or that the mode of alignment is more efficient.

When the intrinsic polarization reaches such a level as is found here, it can no longer be considered as a subtle, secondary effect. The production of sublimate particles is obviously quite high, possibly resulting in radiation pressure expulsion into the interstellar medium. Even if very efficient particle alignment mechanisms are envisioned, the amount of intrinsic reddening and extinction caused by these particles must be quite large. Since the nature of the scattering particles and their method of alignment are unknown at this time, it would appear extremely worthwhile to continue programs of polarimetric observations of these very cool objects as often and at as many wavelengths as possible.

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