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DUST IN A FEW SOUTHERN HII REGIONS

S.K. Ghosh, K.V.K. Iyengar, T.N. Rengarajan, S.N. Tandon,
R.P. Verma and R.R. Daniel
Tata Institute of Fundamental Research, Homi Bhabha Road,
Bombay, 400005, INDIA

We discuss the property of dust in four southern HII region/molecular cloud complexes - RCW 108, RCW 57, RCW 122 and G351.6-1.3. These regions were observed at an effective wavelength of 150 μm using TIFR balloon borne 1 m telescope and deconvolved maps with a resolution of 1' were obtained. We have combined our data with other available data to derive the properties of the infrared emitting dust in these regions.

1. RCW 108 (IRAS 16362-4845)

This region has only one compact source which has a flux density of 12,000 Jy at 150 μm. Our flux density along with those of IRAS is consistent with a dust temperature of 40 K (for deriving temperatures we assume that emissivity $\propto 1/\lambda$). Optical depth at 150 μm is 0.07. IRAS LRS spectrum of this source shows silicate feature at 10 μm and NeII emission line at 12.8 μm. We fitted the spectrum around the absorption feature (7.5-12 μm) using two types of emissivity functions - lunar silicate (lunar rock 14321, Knacke and Thomson, 1973) and the Trapezium type (Gillett et al. 1975). The parameters for the fit were, the temperature of the emitting source (assumed to be black body), and the optical depth of the surrounding shell. The best fits for these two types of grains along with the parameters are shown in Fig. 1. It can be seen that the lunar silicate gives a much better fit to the observed data than the Trapezium type of dust.

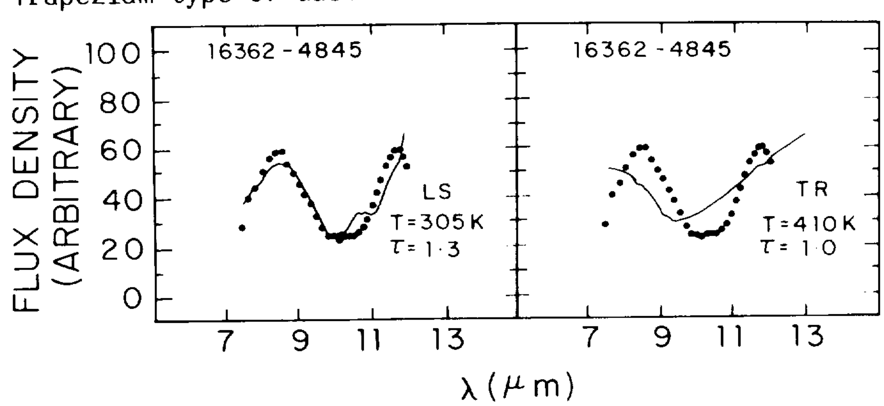

Fig. 1. The observed LRS spectrum (filled circles) of IRAS 16362-4845 along with the two fitted spectra - a) lunar silicate grains (LS) ; b) Trapezium type grains (TR).

2. RCW 57

This region has one strong source and two weaker sources. The main source has a flux density of 24,000 Jy at 150 μm. Our flux density and the IRAS flux densities are consistent with a dust temperature of 40 K. The optical depth at 150 μm is 0.09. If we combine our flux density with that at 1 mm by Cheung et al. (1980), we get a very flat wavelength dependence for emissivity (slope = -0.2) between 150 μm and 1 mm.

3. RCW 122

The map for this region has two bright sources, three isolated weak sources and diffuse emission around the brightest source. The brightest source has a flux density of 21,300 Jy. By combining our data with the flux density at 69 μm observed by McBreen et al. (1985) we get a dust temperature of 60 K. The optical depth at 150 μm is 0.04. Comparing our flux density with that at 1 mm by Cheung et al. (1980) we get a flat emissivity dependence with a slope of -0.6.

4. G351.6-1.3

This region has two HII regions G351.6-1.3 and G351.7-1.2. The source associated with G351.6-1.3 has a flux density of 12,000 Jy at 150 μm. Our flux density and those from IRAS are consistent with a dust temperature of 55 K. The optical depth at 150 μm is 0.03. Our flux density combined with that at 1 mm from Arnold et al. (1978) give the slope for emissivity dependence as -1.2. We did radiation transfer calculations based on the model given by Scoville and Kwan (1976) to fit the spectrum of the source from 2 μm to 1 mm. It is found that the dust distribution with density decreasing inversely with distance fits the observed spectrum better than that with uniform density. The source corresponding to G351.7-1.2 has a total flux density of 8,000 Jy at 150 μm. This source is more extended than G351.6-1.3. The derived dust temperature is 35 K and the optical depth at 150 μm is 0.01.

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