

IRAS09371+1212: A Unique Red Giant With Strong Emission in the 40-70 Micron Bands of Ice

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IRAS 09371+1212 (sometimes called the Frosty Leo nebula) is up to now an absolutely unique object. Its stellar nature has been proved by the detection of circumstellar CO ($J = 1-0$) by Forveille *et al.* (1987), and by its stellar M giant spectral type, although its infrared colors and its visible appearance could have suggested a galaxy (Condon and Broderick 1986). It displays unique IRAS far infra-red colors which have been attributed by Forveille *et al.* (1987) to a strong emission in the 40-70 micron bands of ice. The presence of an extremely large quantity of ice is confirmed by extraordinary strength of its 3.1 micron absorption band (Rouan *et al.* 1988; Hodapp *et al.* 1988; Geballe *et al.* 1988).

The results of our February 1988 KAO observations (Omont *et al.* 1988) have confirmed its unusual nature: the most striking feature is the intensity of the far infrared bands of ice, by far the strongest observed up to now. Its dust temperature, confirmed to be smaller than 50 K by the KAO results, is by far the lowest known for a circumstellar envelope. This fact is certainly related to the anomalous abundance of ice and to its unusually low luminosity for a massive circumstellar envelope. Ice is clearly crystalline, and there is some indication from the results of our modeling that the emissivity index of the silicates is ~ 2 , as in the model of Draine (1985). Its visible and near infrared appearance is also intriguing (Rouan *et al.* 1988; Clemens and Leach 1987; Hodapp *et al.* 1988). It clearly displays a bipolar nebular structure with a strong polarization and a thin dust disk seen edge on.

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