SHORT COMMUNICATIONS

*Infrared Spectra of Polyvinyl Chloride**

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There exist many reports on infrared spectra of polyvinyl chloride, but are found only a few studies[1-5] which deal with crystalline and amorphous bands in the infrared spectra of this polymer.

With respect to some samples of polyvinyl chloride, we have examined correlation between the specific gravity and the optical density in the absorption bands ranging from 4,000 to 700 cm^{-1}.

Polyvinyl chloride was prepared at room temperature with a binary mixture of triethylaluminum and di-*tert*-butyl peroxide as catalyst. The viscosity average molecular weight of the polymer was 32,000. The samples were in the form of thin solid films, which were prepared from tetrahydrofuran solution of the polymer. By heat treatment in the Wood alloy, the specific gravity, d_4^{30}, of the sample was controlled from 1.3887 to 1.4022.

The examination of the infrared spectra of the polymer having various specific gravity has made clear that the ratios of any two of the optical densities at 2920, 1375 and 1092 cm^{-1} remain almost unchanged irrespective of the change in the specific gravity of the samples. Since it was considered, from this result, that each of the bands mentioned above varied in the same way with the specific gravity, the band at 2920 cm^{-1} was taken as standard and the ratio of optical densities at every absorption band to 2920 cm^{-1} band was calculated.

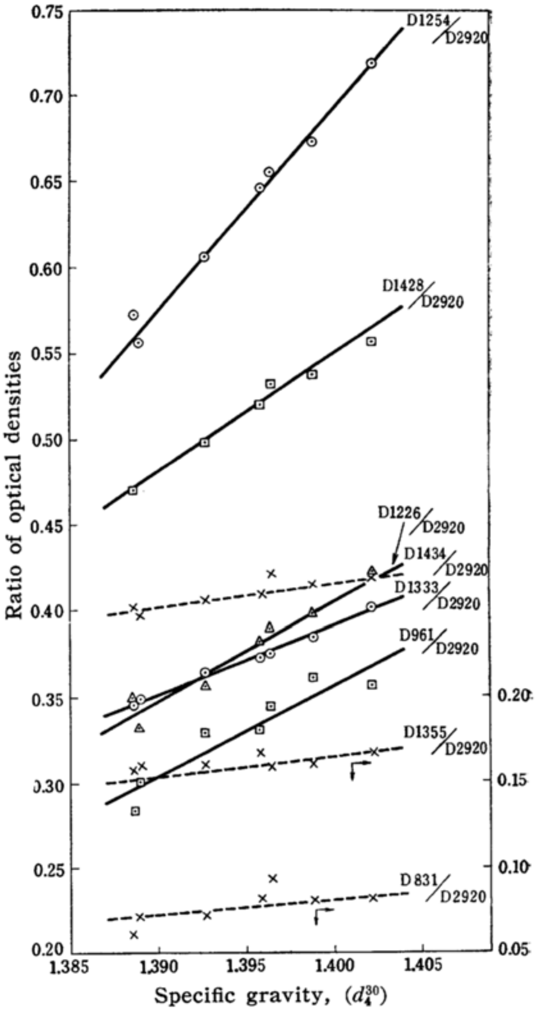

Fig. 1. Relation between optical density and specific gravity.

The liner relationship in Fig. 1 between the specific gravity and the optical density at bands 1428, 1333, 1254, 1226 (distinct parallel band) and 961 cm^{-1}, and the differential absorption band between two polymers having different specific gravity in Fig. 2 lead to the conclusion that these five absorption bands correlate with the specific gravity or crystallinity of the sample. A similar relation was observed

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1) S. Krimm and C. Y. Lang, *J. Polymer Sci.*, **22**, 95 (1956).

2) R. J. Grisenthwaite and R. F. Hunter, *Chem. & Ind.*, **1958**, 719.

3) S. Mizushima, T. Shimanouchi and S. Tsuchiya, Abstract of the Paper read in the 11th Annual Meeting of the Chemical Society of Japan, Tokyo (1958), p. 147.

4) S. Mizushima, T. Shimanouchi and S. Tsuchiya, Abstract of the Paper read in the Sympsoium on High Polymer, Osaka (1958), p. 127.

5) H. Watanabe and T. Hotta, Abstract of the paper read in the Symposium on High Polymer, Nagoya (1957), p. 54.

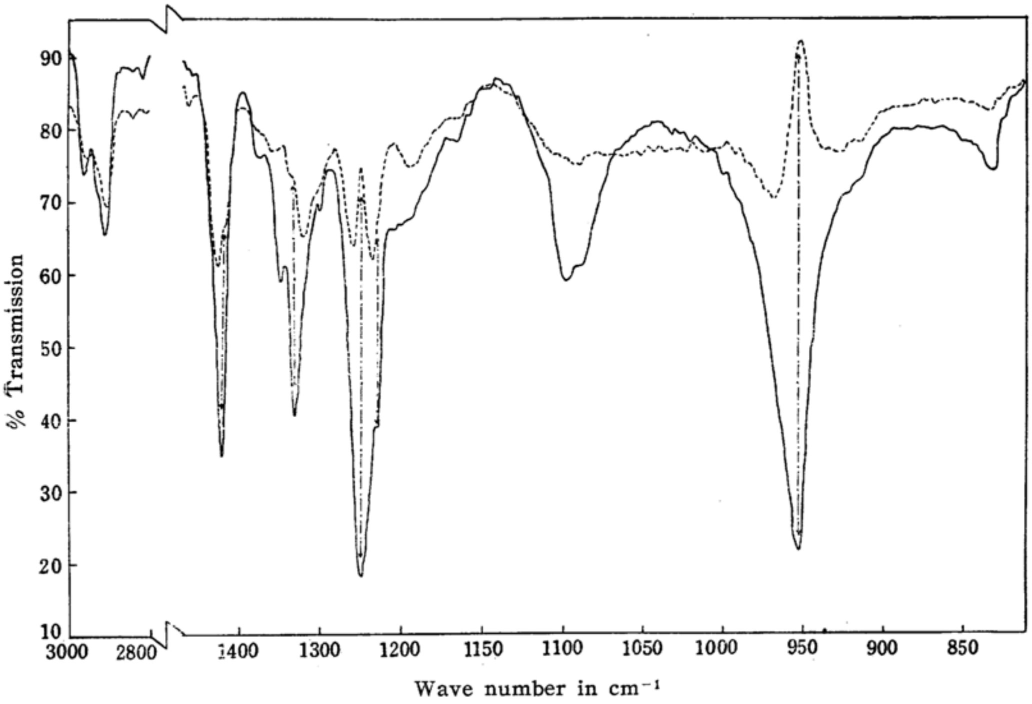

Fig. 2. Differential infrared spectra (——: reference, lower density polymer, ----: reference, higher density polymer.)

also in the absorption bands at 1434, 1355 and 831 cm^{-1} but its dependency upon the specific gravity was much smaller than the above case.

The analysis of these results is under study in our laboratory. Full dentails will be reported in this bulletin.

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