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ESTIMATION OF THE MOBILITY OF MACROMOLECULES IN THE AMORPHOUS REGIONS OF CRYSTALLINE POLYMER BY THE NUCLEAR MAGNETIC RESONANCE METHOD*

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IT IS well known [1] that most crystalline polymers give two-component nuclear magnetic resonance (NMR) spectra at certain temperatures. If the specimen has been sufficiently well dehydrated and freed from low-molecular weight impurities the narrow component corresponds to the amorphous regions of the polymer, where the segments of the macromolecules reorientate with a correlation time $\tau_c \ll 10^{-5}$ sec.

Separation of the curve into its narrow and broad components has so far been used only for determination of the degree of crystallinity or the "index of high-frequency rigidity".

It has been observed that the temperature at which the narrow component appears is dependent on the nature of the polymer. This can obviously be made use of to assess the mobility of the macromolecules in the amorphous region. The study of this problem is the subject of the present communication.

EXPERIMENTAL

The NMR spectra were recorded with the equipment described in reference [2], over the temperature range from 20 to 350°. Before the measurement the specimens were evacuated for several hours at 5×10^{-2} mm, at 100 or 200° depending on the nature of the polymer, and sealed in glass tubes. The crystallinity of the specimens was verified by X-ray analysis. All the polymers studied were highly crystalline.

The polymers studied were polyethyleneterephthalate (PETP), isotactic polystyrene (PS) and a number of aromatic polyamides with the following structural units:

* Vysokomol. soyed. **7:** No. 11, 1894–1898, 1965.