Interrelationship between the Changes in Chain Conformation of Drawn PET Films and their Physical Properties

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The changes in chain conformation of uniaxially-drawn PET films ,which had been annealed at 80 - 240 °C with unrestrained and constant length conditions, were investigated by means of factor analysis and band resolution of their IR absorbance spectra.

Factor analysis confirmed the presence of four absorbing components in the range of 1050-1010 cm^{-1}. And this result could act as a complement to the band resolution. Assuming that each absorbing spectrum was Lorentzian distribution function, the result of band resolution showed that absorbance spectrum in the range of 1050-1010 cm^{-1} could be deconvoluted into four independent Lorentzian curves, *i.e.*, 1043 cm^{-1}, 1025$\pm$1 cm^{-1}, 1020$\pm$1 cm^{-1}, and 1017$\pm$1 cm^{-1}. From the presence of 1020$\pm$1 cm^{-1} peak, the intermediate phase, which had been proved to exist in undrawn PET film, was also ascertained in drawn PET film in addition to amorphous and crystalline phases. The content of each phase was compared relatively with its integrated intensity.

Crystalline phase increased but amorphous phase decreased in their contents with annealing temperature increased. On the other hand, the intermediate phase increased with annealing temperature increased below the critical annealing temperature,

but it decreased above the critical annealing temperature.

There were a good linear relationship between the content of crystalline phase and density and a good correlation between the absorbance of 972 cm^{-1} and birefringence for the taut-annealed PET specimens.