CORRELATION OF THE EXPERIMENTAL CRYSTALLINITY WITH THE MECHANICAL PROPERTIES OF ISOTACTIC POLYPROPYLENE

by

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This thesis is my original work and has not been presented for a degree in any other University.

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ABSTRACT

The degree of crystallinity of variously heat treated samples of isotactic polypropylene were measured at room temperature using an X-ray diffractometer. The tensile strength and Young's modulus of the same samples were also determined at room temperature and the results correlated with the degree of crystallinity.

The percentage crystallinity is found to increase with reduction in cooling rate of the samples. Annealing at different temperatures shows a linear increase in crystallinity with increase in annealing temperature. But increase in the annealing time leads to a Logarithmic relationship between annealing time and crystallinity.

The study shows that the tensile strength and Young's modulus are linearly related to the degree of crystallinity for samples cooled at different rates. For the annealed samples, tensile strength and Young's modulus are linearly related to the degree of crystallinity only at low levels of crystallinity. At high levels of crystallinity, the relationship is not linear. This was unexpected. Lack of linearity is attributed to the large spherulites, which may have

developed at the high annealing temperature and long periods of annealing, with interspherulitic boundaries that act as stress concentrators and thus weaken the material.