# EFFECT OF SORBITOL DERIVATIVES ON MECHANICAL PROPERTIES AND MORPHOLOGY OF POLYPROPYLENE FIBER

THANITA SUTTHATANG

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Science Degree
in Industrial Chemistry
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This thesis entitled "Effect of sorbitol derivatives on mechanical properties and morphology of polypropylene fiber" submitted by Thanita Sutthatang in partial fulfillment of the requirements for the Master of Science Degree in Industrial Chemistry is hereby approved.

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## ABSTRACT



We here report the chloro and bromo derivatives were used as a nucleating agent for polypropylene. Furthermore, sorbitol derivatives can self-organize to form fibrils in nanometers. SEM and TEM micrographs of gel extracted from organic solvent revealed the fibril network of chloro and bromo derivatives which can be observed their diameter in the range 7-216 nm and length higher than 9 μm. Small amount of these materials was blended with isotactic polypropylene (iPP) by two roll mill machine and the mixture was made to fiber form by extrusion. The effect of halogenated sorbitol derivatives on the crystallization of iPP were studied using different scanning calorimeter technique. It was found that addition of small amount of sorbitol derivative increase the crystallization temperature of iPP to 18 °C compared to neat iPP. No further increase in the crystallization temperature when the amount of additive reach 0.5 wt% for para chloro derivatives. The high level of preferred orientation of iPP lamellar is clearly seen when the samples were dispersed with small amount of sorbitol derivatives under high screw speed. The SEM micrographs of cross section of as-spun iPP fiber were indicated the location of sorbitol derivatives fibrils which aligned within iPP melt. The effect of sorbitol derivatives on mechanical properties of as-spun and drawn iPP fiber were studied by using tensile tester. For as-spun fiber, the effect of amount, substitution position, and type of sorbitol derivatives on mechanical properties of iPP fiber were demonstrated. It was found that the elastic modulus of neat iPP can be increased up to 48 % when 1% wt of *p*-Cl-DBS added. For drawn iPP fiber, the tensile strength and elastic modulus of both amount of sorbitol

derivatives (0.5 and 1 % wt) fiber increase with draw ratio increase. While the percentage of elongation of fiber decrease with draw ratio increase.

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