TITLE	EFFECT OF MATRIX MORPHOLOGY ON MECHANICAL AND BARRIER PROPERTIES OF POLYPROPYLENE NANOCOMPOSITE FILMS CONTAINING PREFERENTIALLY ALIGNED ORGANOCLAY PLATELETS
AUTHOR	PATRAPON SANGUANSAT
DEGREE	DOCTOR OF PHILOSOPHY PROGRAM IN POLYMER SCIENCE AND TECHNOLOGY (INTERNATIONAL PROGRAM)
FACULTY	FACULTY OF SCIENCE

ABSTRACT The objective of this research was to study and optimize the effect of matrix morphology on the desirable mechanical and barrier properties of polypropylene/organoclay (PP/clay) nanocomposite films. Nanocomposites with different organoclay contents and three different matrix morphologies were compared with neat PP under identical conditions. The degree of organoclay dispersion was controlled through the use of a compatibilizer, maleic anhydride grafted polypropylene (PP-g-MA). The nanocomposite films were first prepared by melt casting and then subjected to annealing and re-crystallization. Organoclay platelets in all films were found to align parallel to the film plane. Crystalline PP in as-prepared films was found to have a preferred orientation with the lamellae normally lying perpendicular to the machine direction. Upon annealing, the stacks of parallel lamellae, aligned perpendicular to the machine direction and the film surface, tend to be more orderly than in as-prepared films (see models). No crystal orientation was found in re-crystallized films. A clear increase in elastic modulus and tensile strength with increasing organoclay content was observed. Relative oxygen permeability (ROP) of nanocomposite films decreased with increasing amount of organoclay. The effect of matrix morphology is as follows: annealed films display the highest elastic modulus, tensile strength and ROP, followed by as-prepared and re-crystallized films.