Processing conditions to control structure-property of nucleated/non-nucleated polypropylene nanocomposite films

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Processabilty of nanoclay reinforced polypropylene films and properties imparted thereby have attracted applications in packaging industries. However, control of film thickness uniformity as also the effect of nanoclay on the blow-up ratio is intimately related to its (nanoclay) effect on the crystallinity and film morphology. In the present work film blowing of PP (polypropylene) as also of PPNC (polypropylene nanocomposites) with nanoclay in increasing concentrations was carried out. The subject of investigation was correlation of PP film blowability with film morphology. PP films with blow-up ratio of 2.6 were prepared. Although nanoclay reinforced films of 1 and 2 and 3 phr were prepared, it was observed that the bubble stability decreased as the content of nanoclay was increased above 3 phr. However quite interestingly, there was a marked decrease in film thickness variation as compared to films of extruded polypropylene. Films with increase in take-off speeds at fixed extruder outputs were also prepared. The films were analysed for crystallinity and film morphology as also the mechanical properties. Rheology as a tool to predict changes in microstructure of nucleated/non-nucleated PPNC films was carried out. Film morphology /crystallinity were investigated with polarizing-optical microscopy. From the various studies the structure properties were endeavored to be correlated with the processing conditions for preparation of nucleated/nucleated polypropylene nanocomposite films.

Keywords: polypropylene, nanoclay, processability, crystallinity, morphology