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COMPARATIVE STUDIES OF BLENDING TECHNIQUES AND DISPERSIBILITY
OF ORGANIC PIGMENTS IN MEDIUM DENSITY POLYETHYLENE POWDER

Miss Ratchanu Buhngachat



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

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..... Dean of Faculty of Science
(Associate Professor Wanchai Phothiphichitr, Ph.D.)

THESIS COMMITTEE


..... Chairman
(Associate Professor Saowaroj Chuayjuljit)


..... Thesis Advisor
(Assistant Professor Duangdao Aht-Ong, Ph.D.)


..... Member
(Associate Professor Paiparn Santisuk)


..... Member
(Associate Professor Onusa Saravari)


..... Member
(Assistant Professor Pranut Potiyaraj, Ph.D.)

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This research investigated the effects of pigment types, pigment contents, blending techniques, and manufacturing processes on the mechanical, physical, and thermal properties of colored MDPE which composed of medium density polyethylene (MDPE) and pigments. Three organic pigments, diarylide (PY83), phthalocyanine (PB15), and quinacridone (PR122) pigments were used and the amount was 0.1, 0.2, 0.3, and 0.4 phr. The results showed that the optimized process condition for preparing of colored MDPE via twin screw extruder in melt blending technique was 30 rpm of screw speed and 180 °C in mixing temperature. The results on mechanical properties showed that the amount of pigments might be too small to cause any significant changes in tensile modulus, tensile stress, flexural modulus, and flexural strength. Whereas, the impact strength and %strain at break of the colored MDPEs slightly decreased when increasing the pigment content. However, the overall mechanical properties of colored MDPEs were slightly inferior compared to the colorless MDPEs, especially for %strain at break. The results might be due to the effect of poor adhesion between MDPE and pigments. Comparing in three pigment types, the PY83 colored MDPEs had higher in %strain at break and flexural strength but lower in impact strength. Because the properties of colored MDPEs are mainly affected by blending technique, twin screw extruder was employed in melt blending technique to improve the dispersibility and compatibility of colored MDPEs. The results showed that the mechanical properties of the colored MDPEs from melt blending technique were superior than those from dry blending technique and rotational molding process. Because of the shearing forces in twin screw extruder contributed to the higher MFI of pelletized extrudate, compared with the dry mixture powder of colored MDPE before the mixing process in twin screw extruder. In addition, it was found that the use of pigment produced the lower in %crystallinity of colored MDPE compared with the colorless MDPE. Furthermore, an increase of pigment content had no effect on the %crystallinity. Consequently, the three organic pigments acted as an interference on the crystal formation in MDPE.

Department Materials Science

Student's signature Ratchanu... Buhngachat

Field of study Applied Polymer Science and Textile Technology

Advisor's signature Duangdao Aht-ong

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