

Nattha Thaweegan 2006: Thermal Properties of Degradable High Density Polyethylene-Plastic-Film. Master of Science (Physics), Major Field: Physics, Department of Physics.
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Thermal properties and degradability of high density polyethylene (HDPE) blended with eight different amounts of CaCO_3 were studied by Differential Scanning Calorimetry (DSC). Four different heating and cooling rates, 5, 10, 15 and 20 $^{\circ}\text{C}/\text{min}$ under nitrogen environment were performed. In endothermic process, the phase transition peak shifted to lower temperature with the heating rate ascending. In exothermic process, the results showed similar evolution of crystallinity temperature and the corresponding enthalpy as the endothermic process.

Relative degree of crystallinity $\chi(T)$ of the HDPE- CaCO_3 plastic film showed the same sigmoid shape which was due to the lag effect of cooling rate on crystallization. The nonisothermal crystallization kinetics were investigated by Ozawa method derived from Avrami analysis. The addition of CaCO_3 increased Ozawa exponents m , but decreased logarithm of crystallization rate constant $\ln Z(T)$ of pure HDPE-film. The respective Ozawa exponents m and $\ln Z(T)$ at 110 $^{\circ}\text{C}$ crystallization temperature were 0.13 and 19.16. Crystallization activation energy of pure HDPE film calculated from Kissinger equation was 177.0 kJ/mol and was increased as the higher content of CaCO_3 .

Morphology of the plastic film examined by scanning electron microscope revealed the bigger dispersed size of CaCO_3 in the higher CaCO_3 content in HDPE-film.

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