

Chutima Paksunchai 2006: Thermal Degradation of Degradable Polyethylene-Plastic-Film by Thermogravimetry. Master of Science (Physics), Major Field: Physics, Department of Physics. Thesis Advisor: Associate Professor Supreya Trivijitkasem, Dr. Ing. 100 pages.
ISBN 974-16-2268-6

Thermal degradation of high-density polyethylene (HDPE)-CaCO₃ plastic-film was studied by thermogravimetric analysis (TGA). Six different heating rates 5, 10, 15, 20, 25 and 30 K/min were performed. Three different thickness, 8, 10 and 15 μm of six HDPE:CaCO₃ ratios were used: 100:0, 90:10, 85:15, 80:20, 75:25 and 70:30. The degradation of pure HDPE plastic-film in nitrogen occurs in one step. The decomposition temperature shifts to higher temperature as the increased heating rate. The degradation of HDPE-CaCO₃ plastic-film in nitrogen occurs in two steps: the first step is due to the degradation of HDPE, the decomposition temperature range is 700-800 K and the second step is due to the degradation of CaCO₃, the decomposition temperature range is 900-1000 K.

The kinetic parameters were determined by peak property method (PPM). The reaction order, the activation energy and natural logarithm of pre-exponential factor of the plastic-film were achieved at average values. The respective average values of 8 μm HDPE plastic-film are 0.94, 285.4 kJ/mol and 45.5 min⁻¹. The average value of reaction order of every plastic-film is nearly constant and nearly equals to 1. The other two kinetic parameters of HDPE-CaCO₃ plastic-film are decreased as increased thickness and higher percentage of CaCO₃ in the plastic-film.

Morphology of the plastic-film examined by scanning electron microscope (SEM) reveals bigger size of dispersed CaCO₃ particle in the thicker thickness and higher percentage of CaCO₃ in the plastic-film.

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