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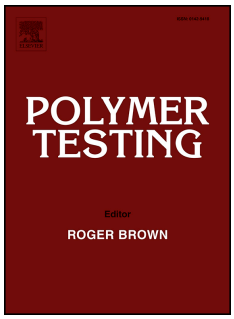

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Comparative thermal decomposition kinetic analysis of the biodegradable terpolymer poly(lactide-co-propylene carbonate) applied by various theoretical models

Guojia Huang[1]*, Jinmei Lin[1], Bo Yang[1], Maodong Li[1], Yujie Li[2]*,Wei Zhai[1], Zhigang Wang[1], Guanbao Li[1], Lushui Li[1]

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Abstract: The thermal stability and non-isothermal decomposition kinetics of the terpolymer poly(lactide-co-propylene carbonate)(PLAPC) were studied by thermogravimetric and derivative thermogravimetric analyses with multiple heating rates (2.5, 5, 10, 20 °C min^{-1}) under nitrogen gas atmosphere. The microstructure and molecule thermal transition property of PLAPC were examined by ^{1}H-NMR, FTIR and differential scanning calorimetry(DSC) respectively. The decomposition kinetic parameters of PLAPC were calculated using ‘‘model-free’’ integral method (Flynn-Wall-Ozawa), ‘‘model-free’’ differential method (Kissinger) and ‘‘model-fitting’’ method (Tang). Its average activation energy thus obtained with different methods ranges from 96.62 to 104.91 kJ mol^{-1}. 12 kinetic models were employed to check the most probable decomposition mechanism. The results showed R2 model, F1(A1) model and R3 model are the most probable to fit the decomposition mechanism.

Keywords: Poly(lactide-co-propylene carbonate), Kinetic analysis, Isoconversional method, Model free, Model fitting

1. Introduction

With the increase of human population and development activities, the plastic consumption is also increasing rapidly. The resulted waste plastic has become a major contributor to the municipal solid waste. The trend for material and energy recovery from wastes has been a popular way to dispose waste plastics. Pyrolysis of plastic can transform it into valuable chemicals[1], which has led to an increasing interest in the development and understanding of wastes thermal treatment processing.

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