Pyrolysis kinetic analysis of poly(methyl methacrylate) using evolved gas analysis-mass spectrometry

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Abstract:

The results of evolved gas analysis-mass spectrometry (EGA-MS) analysis were used for the kinetic analysis of poly-methyl methacrylate (PMMA) pyrolysis for the first time. Various kinetic methods, such as model-free, integral master-plots, and model-fitting methods, have been applied to derive the kinetic parameters (activation energy, pre-exponential factor and reaction model). The PMMA pyrolysis reaction mechanism was suggested to occur via a single step unzipping reaction producing methyl methacrylate (MMA) as the main pyrolyzate from the kinetic analysis results and mass spectrum obtained from the EGA-MS measurements. The kinetic parameters derived from model-free method combined with the integral master-plots method were comparable to those obtained from the peak property method (PPM). The theoretical curve derived from the kinetic results by the PPM was also well matched with the experimental thermal conversion curve using the EGA-MS measurements.

Frontier Labs Products used:

Multi-Shot Pyrolyzer (EGA/PY-3030D), UA-DTM-2.6N