

KINETIC STUDIES OF SOLID STATE THERMAL DEGRADATION FOR MATERIAL LIFETIME ASSESSMENT AND THERMAL PROCESS OPTIMIZATION

Innovations and Benefits - The estimate of the useful life (lifetime) of a material or of the thermal reaction time (pyrolysis or combustion) can be performed through the kinetics studies of thermal degradation. The data obtained from experimental tests in thermobalance under isothermal or non-isothermal conditions on the samples of interest are processed with advanced computing methods to determine the kinetic parameters of degradation (activation energy, pre-exponential factor and reaction model) which then allow to calculate the life or reaction time. Both the experimental tests and the computing are conducted following the recommendations of the Kinetics Committee of the International Confederation for Thermal Analysis and Calorimetry (ICTAC).

Use - Calculation of reaction or life times through the determination of kinetic parameters. The reaction time is the first step in the design of reactors for thermal processes.

Applications and ongoing Activities - Solid state kinetic analyzes of thermal degradation were carried out on plastic matrices of different polymeric composition and variable complexity. Origin of plastics from electrical and electronic waste and from plants for separate waste collection. Procedures for conducting analyzes and spreadsheets have been developed based on the kinetic methods reported by the ICTAC. In the case of overlapping degradations, a software is used to separate the relative peaks.

