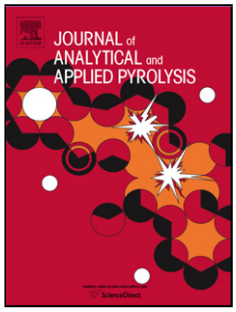

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The thermal decomposition mechanism and kinetics of tenoxicam

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Highlights

- ·The thermal decomposition of tenoxicam was studied with various instruments and methods.
- ·The mechanism of the thermal decomposition of tenoxicam has been proposed.
- ·The kinetic parameters of thermal decomposition, such as E_a and A, were obtained.
- ·The prospective lifetime of tenoxicam was speculated.

Abstract Tenoxicam (TNX) is a non-steroidal anti-inflammatory drug. Its thermal decomposition processes were studied with thermogravimetry and differential thermal analysis. The produced gaseous products and residues during decomposition were detected and characterized using Fourier transform infrared spectroscopy. Combining with the molecular bond order distribution obtained from the quantum chemistry calculation, the thermal decomposition mechanism of TNX has been speculated. The kinetic parameters for thermal decomposition, such as activation energy E_α and the pre-exponential factor A, were obtained using the ATSM E1641 method. The prospective lifetime of TNX was estimated using the ATSM E1877 method. The results indicated that the thermal decomposition of TNX is a three-stage process. During the first stage of thermal decomposition, the main part of the molecule, including sulfamide, thiophene and amide, decompose simultaneously, and to form gasifiable small molecules and carbonized residues. The initial decomposition temperature in either nitrogen or air is about 204 °C. For decomposition in nitrogen, the E_α and A for the initial thermal decomposition are 174.8 kJ mol^{-1} and 2.512×10^{17} min^{-1}, respectively. For decomposition in air, the corresponding E_α and A are 179.4 kJ mol^{-1} and 7.943×10^{17} min^{-1}, respectively. The TNX has good thermal stability under routine temperature.

Keywords Tenoxicam (TNX); Mechanism of thermal decomposition; Kinetics of thermal decomposition; Quantum chemistry; TG–FTIR

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