

# **THERMAL RISK ASSESSMENT AND RANKINGS FOR REACTION HAZARDS IN PROCESS SAFETY**

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## **ABSTRACT**

Reaction hazards remain the most serious concern in the chemical industry in spite of continual research and attention devoted to them. Many commercial calorimeters, such as the Differential Scanning Calorimetry (DSC), are useful screening tools for thermal risk assessment of reaction hazards. Some important thermodynamic and kinetic parameters, including onset temperature, adiabatic time to maximum rate, and maximum adiabatic temperature, were analyzed in this paper. A kinetic-based model under adiabatic conditions was developed, and the adiabatic time to maximum rate was estimated. Correlations between onset temperature ( $T_o$ ) and activation energy ( $E_a$ ), and between onset temperature ( $T_o$ ) and adiabatic time to maximum rate ( $TMR_{ad}$ ) were found, and were illustrated by some examples from the previous literature. Based on the heat of reaction and the adiabatic time to maximum rate, a thermal risk index (TRI) was defined to represent the thermal risk of a specific reaction hazard relative to di-tert-butyl peroxide (DTBP), and the results of this index were consistent with those of the reaction hazard index (RHI). The correlations and the thermal risk index method could be used as a preliminary thermal risk assessment for reaction hazards.