

Applications for Process Safety and Energetics

1) Chemical Processes

2) Energetic Materials

CHEMICAL PROCESSES

Temperature, heat, pressure and kinetics of reaction or decomposition under normal or runaway conditions. Heat capacity of substances.

Calorimetry for chemical process risk assessment



Setaram calorimetry is essential for chemical process safety, measuring temperature, heat, pressure and reaction or decomposition kinetics, both under normal and runaway conditions. It helps determine the heat capacity of substances, ensuring accurate assessment of thermal risks and better process control.

The process safety laboratory is essential for any chemical manufacturing site. Regardless of the quantities synthesized, every process step and every reagent or product must be assessed with regard to its thermal stability in order to minimize risks. Our solutions, in particular Calvet calorimeters, have become standard in these laboratories.

Quick Screening	At an early stage, you can gain a fast indication of thermal instability through testing small samples with a DSC. It measures the temperature and heat of decomposition.
Thermal Stability	You can test more in-depth any suspect materials from the screening stage. Due to the central role of gas releasing reactions in plant process hazards, samples of about 5-10g are heated in cells equipped with a pressure sensor.
Adiabatic Tests	With an adiabatic reaction calorimeter (A.R.C.), you can test samples at minor to no heat loss conditions. Adiabatic conditions are a worst case scenario, but they are quite realistic for large plant vessels that lose heat slowly.
Modelling	Thermokinetics and thermal safety software serve as a complement to all process safety studies. Scenarios can be modelled to reduce the number of actual experiments, speeding-up process safety testing.
Process Understanding	After initial screening and/or thermal stability testing it's necessary to understand the desired chemical reaction. You can use Reaction Calorimetry to determine how much heat is given out under normal operating conditions. The focus here is on heats of reaction, heat flows and gas evolution.

More details on Brochure

<https://setaramsolutions.com/app/uploads/sites/2/2020/09/EN-PROCESS-SAFETY.pdf>

ENERGETIC MATERIALS

Temperature, heat, pressure and kinetics of decomposition.

Energetic materials testing with calorimetry



Setaram calorimetry is used to characterize energetic materials such as explosive powders and propellants. It measures temperature, heat, pressure and decomposition kinetics, providing essential information on the thermal stability and reactivity of substances. These data are vital to guarantee the safety and efficiency of manufacturing processes and the use of these materials.

Materials like gun propellants, fuel for rocket engines, and explosives, contain high energy and are thus termed energetic materials. Such materials need to be kept stable for long periods and to release their energy quickly on demand. We provide solutions to study and optimize all factors.

Stability	You need to check the stability of energetic materials before transporting and storing them. Calorimetry is especially well-suited to detecting stability loss at an early stage. DSC, Calorimetry and TGA data combined with Thermokinetics software can simulate very long-term material stability.
Decomposition	You need data about an energetic materials decomposition to design efficient and safe systems. RSC, calorimetry, DSC, and TGA inform about decomposition temperature, heat, pressure and gas release. They also provide kinetics data.