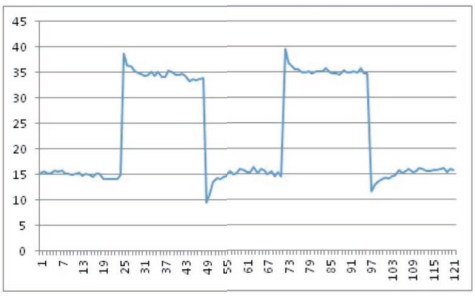
For Determining Reaction Enthalpy

Power Compensation Reaction Calorimeter

Parr is excited to introduce a new feature for our reactor systems allowing users to determine reaction enthalpy using a technique known as power compensation calorimetry.

Power compensation calorimeters offer a direct and intuitive method to quantify the process power and calculate the enthalpy of the reaction. A reaction vessel with a circulating jacket is isothermally controlled and the jacket is normally set to a temperature just below the desired reaction temperature. The process temperature is regulated by adjusting the power to an electrical heater located inside the reaction vessel. This electrical heater is known as a compensation or trim heater. As the process heat load changes, the electrical power to the heater is automatically varied to maintain the desired process temperature. Heat liberated or absorbed by the process is determined from the difference between the initial electrical power and the demand for electrical power at the time of measurement.

This method requires no calibration before or during the process and is often used to obtain rapid results. Power compensation calorimeters generally attain thermal equilibrium more rapidly than heat flow or heat balance calorimeters, making them advantageous for measuring heat flow from short-lived reactions.



The above plot shows the resulting transient temperature changes in a reactor equipped to perform power compensated calorimetry. The 4547 jacketed reactor used here has an internal volume of 1.2 L and was half full of water. Data were recorded at one minute intervals while the set point bias was toggled 1.5 C. The y-axis is the trim heater power (watts).

Reaction calorimetry facilitates the following goals.

- Study factors influencing reaction mechanisms and kinetics.
- Verify the completion of a reaction in real time.
- Establish cooling power needed to maintain safe and effective process conditions.

Implementing this feature requires three fundamental components or subsystems.

- A jacketed vessel with a constant temperature circulating bath.
- An appropriately sized and configured trim or compensation heater equipped with a regulated power supply.
- Parr 4871 Process Controller to control and coordinate the overall operation of the system.

Let us build one for you.

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