

Introduction of a new, calibration-free reaction calorimeter that combines the benefits of DSCs and RCs

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The Reaction Calorimeter CPA202 (Chemical Process Analyzer) determines thermal effects by measuring the True Heat Flow (THF) based on new design principles /1/. In particular, measurements can be performed without requiring any calibration procedures and the obtained results are most reliable and exhibit extremely stable baselines. The benefits in respect of experimental speed, data quality and long term performance are obvious.

Due its broad dynamic range the instrument is employed for measurements of small physical heat effects, like the ones observed in dissolution processes, as well as of more dramatic, chemical heat effects, like the ones observed with Grignard reactions. The CPA allows to run experiments seamlessly with reaction volumes between 10 and 180ml. This volume flexibility simplifies the investigation of multi-step operations and is the basis for various applications employing precious or highly energetic compounds.

Due to the fact that calibrations are not required, changing conditions during the reaction like changing viscosities of the reaction mixtures or changing liquid levels inside the reactor do not affect the results of the measurements.

Heart of the instrument is a reactor that can be equipped with all types of peripheral devices like various sensors and dosing capabilities for liquids, gases and solids that are necessary to test process configurations and study process parameters. A recently developed software package allows conditioned dosing, i.e. dosing is controlled by the measured, current process parameters. Therefore, more safety and quality can be implemented in processes.

The instrument exhibits not only the typical advantageous characteristics of a reaction calorimeters but offers at the same time benefits like smallness, bench top operation, ease-of-use and, most importantly, experimental speed and high throughput. These are attributes which have been reserved in calorimetry for DSC instruments. Beside the fact that the CPA can be used for a number a material testing applications, are these the reasons to claim that this instrument combines benefits of DSCs and RCs.

/1/ R. Widell and H.T.Karlsson in *Thermochim. Acta* 447 (2006) 57-63