

## **High performance calorimetry in combination with alternative process analytical technology (PAT) solutions: spectroscopy, FBRM and endoscopy**

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The on-line Process Analytical Technology (PAT) based process investigation and monitoring has always been considered as an extraordinary opportunity to investigate and understand the chemical processes. In this context, the heat signal is perhaps the most fundamental extensive property of a chemical system and it provides the platform for *calorimetry*.

The focus of this talk is to present recent advances related to the design of the in-house developed and patented series of calorimeters. The novel and particular feature of these calorimetric reactors is the accurate and calibration free (heat transfer coefficient does not have to be calibrated a priori) determination of reaction kinetics enthalpies in 20-45 mL volumes. After a historical presentation of the calorimeter development, several chemical reaction and reactive dissolution case studies are presented.

In the second part of the talk the use of ATR-FTIR and ATR-UV spectroscopy, focused beam reflectance measurements (FBRM) and endoscopy methods are discussed as complementary PAT tools to calorimetry and several reaction case studies of academic and industrial relevancy are presented. The talk will also address data analysis, kinetic modeling challenges and computational methodologies developed in our group.

For more information on the activities in the field of PAT assisted optimization of chemical processes of the Safety and Environmental Technology group please visit:

<http://www.sust-chem.ethz.ch/research/groups/ReactionCalorimetry>  
[http://www.sust-chem.ethz.ch/research/groups/separation\\_technologies](http://www.sust-chem.ethz.ch/research/groups/separation_technologies)