TAM III - A New Generation (micro/nano-) Calorimetric System from Thermometric for Isothermal, Step-wise and Slow temperature Scanning Applications

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Thermometric AB in Sweden, recently introduced TAM III – a third generation microcalorimeters consisting of a hierarchically structured range of products. The system is modular with a high precision thermostat as the basic module, followed by various types of calorimetric units and insertion ampoules, the type of which is dependent on the type of application. The instrument is designed for multi-sample measurements and allows up to 48 measurements to be performed simultaneously.

A user-defined temperature profile determines the type of experimental design, i.e. isothermal, slow continuous scanning or step-wise scanning. By software control, the calorimeters can either operate as heat flow or power compensation calorimeters. The heat flow mode is used for slow reactions and optimal resolution. Power compensation can be used for monitoring rapid processes, for instance the sensitivity and time taken in ITC applications is greatly improved by using this option. A newly developed, application software, the TAM Assistant™, controls all channels individually. The software is used for data collection, control of devices, data analysis and report creation. A local network is used to enable remote PC control and data analysis.

For complex systems, multiple mixtures of a formulation can be studied simultaneously for the evaluation of interactions between the constituents in compatibility studies. Due to the step-wise scanning capabilities, activation energies for slow decomposition reactions can be determined in a single experiment. TAM III can also be used for very slow scanning experiments with scanning rates below 2 K h^{-1}. The slow scanning rate is compensated by the large amount of substance (1-4g) and the high sensitivity. This enables measurements of phase transitions with a very high temperature resolution in the order of 10^{-6} K and with the sample in virtual thermal, chemical and physical equilibrium.

A description of the new calorimeter, performance characteristics, and examples of isothermal, step wise, and slow scanning experiments on some selected systems exhibiting polymorphism, slow decomposition reactions etc. will be given in the presentation.