Adiabatic scanning calorimetry (ASC) [1] allows a direct determination of the enthalpy from the constant power applied to the sample and the temperature evolution of the sample. Moreover, numerical differentiation of this temperature-time evolution leads to the heat capacity. The constant power and consequently the slow effective scanning rate near and during phase transitions allow a very high resolution in the temperature dependence of the enthalpy. The enthalpy of a number of linear n-alkanes between tetradecane (C14) and tetracosane (C24) is studied. Below the melting, most alkanes in this range show rotator phases before crystallizing. Some of these can only be reached by supercooling the sample [2]. Therefore, ASC was applied in heating and cooling scans at slow rates (0.5-2 K/h in the liquid phase). The enthalpy profiles showed that the transitions are first order; the largest latent heats are for the rotator-liquid and crystal-rotator transitions. The latent heats of the different rotator-rotator transitions are much smaller. Additionally, the high resolution of ASC revealed several smaller features in the vicinity of the phase transitions, which may be associated with parts of the sample that interact with the walls of the sample cell. For example, in C24, upon heating, the crystal-rotator and rotator-liquid transitions are detected, both have a large latent heat. Upon cooling, the liquid-rotator transition did only supercool by 0.1 K in this case (being an exception), but the rotator-crystal transition supercooled by some 5.5 K; in this supercooled region, two rotator-rotator transitions were observed, which were weakly first-order transitions. Several spikes were seen in the rotator phases.
