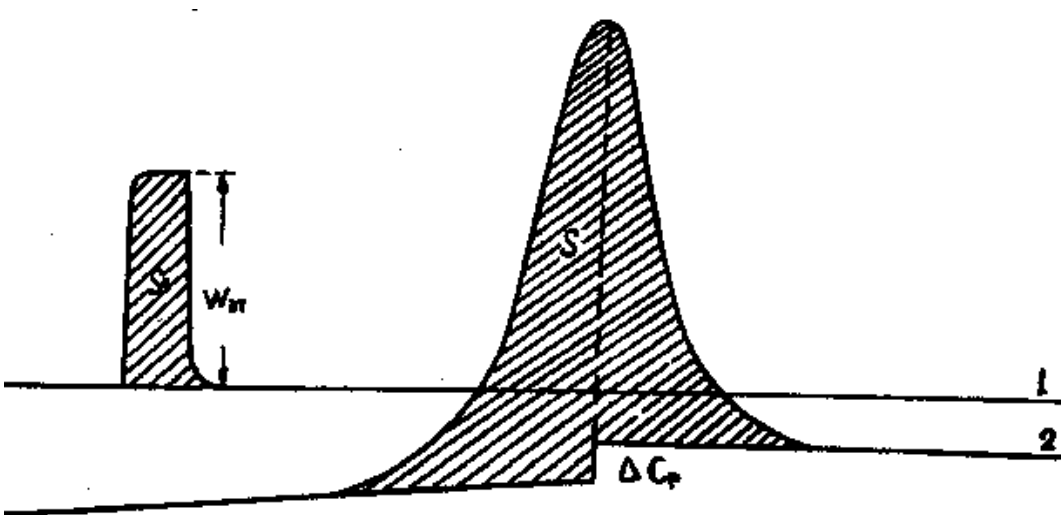
Calculation Heat Capacity from Calorimeter carve.

The processing of the calorimetric curves is conducted as follows. On the Fig the typical calorimetric record observed in heated biopolymer solutions (proteins, nucleic acids, etc.) is brought with the base line (the record at scanning “solvent – solvent”) and the calibrating mark

It is possible to determine the denaturation heat of a biomacromolecule structure by means of the area of the denaturation peak limited from below by the extrapolated values of heat capacity of the native and denaturated states of biological structures.. For this it is possible to use the formula $Q = k_1S$, where Q is the denaturation heat, S is the area under the heat absorbtion peak, and k_1 is the price of the area unit on the record in energy units ($k_1 = Wet \cdot t/Set$, where Wet is the power, carried in one of chambers for a time t, and S_{cal} is the area of the calibrating mark (see Fig.9). The partial heat capacity of the soluted substance can be calculated by the record at any temperature, bearing in mind that

$$-\Delta C = [C]^{p}_{p} \cdot m_p - [C]_{p}^{s} \cdot \Delta m_s,$$



1 - Base line. 2 - Recorded curve for solution.

where $[C]_p^p$ and $[C]_p^s$ are the partial heat capacities of the soluted substance and solvent; m_p is the mass of the soluted substance in the working volume of cell; Δm_s is the mass of the solvent forced out by it. As far as

$$\Delta m_s = m_p \frac{[V]^p}{[V]^s},$$

where $[V]^p$ and $[V]^s$ are the partial volumes of the soluted substance and the solvent, we have

$$[C]_p^p = [C]_p^s \frac{[V]^p}{[V]^s} - \frac{\Delta C}{m_p},$$

where $\Delta C = k_2 h$ is the difference of the heat capacities between the solvent and solution; h is the deflection of the point from the base line at any temperature, and k_2 is the price of the unit of deflection (from a straight line) expressed in J/K·sm; $k_2 = W_{et}/Vl_{et}$, where W_{et} is the calibrating power, V is the heating-up rate (K/sec), l_{et} is the deflection of the calibrating mark from a straight line. Finally, the formula, which we have used, has the form of:

$$[C]_p^p = [C]_p^s \frac{[V]^p}{[V]^s} - \frac{Wet \cdot h}{Vlet \cdot m_p},$$

The processing of the calorimetric curves was conducted by means of PC and the specially written program, created at our Chair [136].

In the present dissertation work the microcalorimeter DASM-4A (issue of the Special Design Bureau of biological apparatus-building of Academy of Sciences of Russia) was used. The main technical data of this calorimeter are brought in the Table 2. The contact of the microcalorimeter DASM-4A with PC is realized by means of the interface scheme, created at the macromolecule Physics Chair of Tbilisi State University.