By considering that the temperature of the end of the thermal effect and the return of the thermal curve to the baseline do not coincide new calculation methods for the thermal effect become possible. Both the integral value of the thermal effect and its distribution over temperature may be calculated by processing only that part of the DTA curve which corresponds to the temperature interval of the transformation.

It is demonstrated on the examples of non-variant transformation and transformation with an even distribution of the thermal effect over the temperature interval of the transformation that, under certain assumptions, the values of the thermal effect calculated by the suggested method and by the area of the peak are identical.

In the overwhelming majority of studies involving the application of differential thermal analysis, no sharp difference is made between two values: the temperature at which the transformation ends, and the temperature at which the thermal curve returns to the baseline. As a result, not only is the accuracy of reading the temperature interval of the transformation reduced, but the means of calculating the thermal effects will be limited, and calculations concerning the distribution of the thermal effect within the temperature interval of the transformation will be incorrect or deficient.

Let us use the following symbols:

- $T_i, T_f =$ initial and final temperature, respectively, of the deviation of the thermal curve from the baseline;
- $T_I, T_F =$ initial and final temperature, respectively of the transformation (for non-variant transformations, $T_I = T_F = T_{\text{non}}$);
- $\tau_i, \tau_F =$ moment of the start and the end, respectively, of the transformations;
- $\Delta I =$ difference in the heat contents of the substance in question at the temperatures $T_F$ and $T_I$, relative to unit volume;
- $Q = \Delta I - \int_{T_I}^{T_F} C_s dT =$ thermal effect of the transformation, where $C_s$ is the heat capacity of the substance in question, relative to unit volume (for transformations of the type of second-order phase transitions and $\lambda$-type heat capacity functions, the term $C_s$ may be understood as the "background" value of the heat capacity, and $Q$ as the excess part of the enthalpy above the "background");
- $q = dQ/dT =$ intensity of the thermal effect.
It is obvious that

\[ Q = \int_{T_i}^{T_f} q \, dT \]  

(1)

For a non-variant transformation

\[ Q = \Delta I = Q_{\text{non}} \]  

(2)

The traditional way to calculate the thermal effect is to introduce some time function whose integral is proportional to the value of the thermal effect. This approach is justified if one assumes that the function in question describes the temperature difference of the sample under study as compared to the temperature that the sample would have if no thermal effect of the transformation existed. It is important to note that this difference, arising at the moment when the transformation starts (to which the point \( T_i \) corresponds in the thermal curve) will not disappear immediately after the end of the transformation. Therefore, a portion termed the after-effect portion will exist in the thermal curve. It begins at \( T_f \) and ends in an asymptotical transition into the baseline (to which the observed point \( T_i \) corresponds). Consequently, in the traditional calculation of the thermal effect one operates with an area bordered by the thermal curve in the section \( T_i - T_f \), which will not coincide with the integral of the transformation \( T_1 - T_F \). The proportionality factor between the area of the peak and the thermal effect will be discussed in a later part of this paper.

The analytical description of the thermal processes in DTA will be carried out similarly to [1-4] and others, assuming that the temperature and other parameters of the sample under study and of the reference sample are constant over their volume at each moment of time. The experimental approach to this model is an instrument in which the heat exchange between the block and the samples takes place over sufficiently large heat resistances, so that temperature transfers in the interior of the samples are small in comparison to the transfers over the above-mentioned resistances. Reduction in the size of the samples, lower heating rates, and also agitation of liquid or powdered materials will promote the approach to the model of the calculation.

A calculation using a linear approach of the heat exchange between the sample being tested at the temperature \( T_s(\tau) \) and the block at the temperature \( T_b(\tau) \), of the heat exchange between the sample and a number of heat outlets with the temperatures \( T_{oj} \) \((j = 1, 2, \ldots, k; \tau = \text{time})\), and also of the heat exchange between the samples, leads to the following equation for the capacity absorbed in unit volume of the sample studied:

\[ n = A(T_b - T_s) - \sum_{j=1}^{j=k} B_j(T_s - T_{oj}) - D(T_s - T_r) \]  

(3)

where \( A, B_j \) and \( D \) are coefficients independent of temperature.

An analogous equation for the reference sample with the temperature \( T_r(\tau) \) can be established, including on the left-hand side the heat capacity of the reference