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Temperature dependence of the activation energy of viscous flow for ovalbumin in aqueous solutions.

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The activation energy of viscous flow DE is usually defined as a minimum energy required for a molecule to escape the influence of its neighbouring molecules. In many cases, it is obtained from the slope of the line that represents the dependence of the liquid viscosity h (in logarithmic scale) versus a reciprocal of the absolute temperature (T-1). More strict definition, which allows calculation of DE at the individual temperature is: DE = R[dlnh/d(T-1)], where R is the gas constant. A modified Arrhenius formula gives an analytical function which describes the viscosity-temperature dependence for globular proteins solutions – in a wide range of temperatures. Such function applied to the above definition shows that square function describes the dependence of DE for proteins solutions on temperature. To apply it for ovalbumin, the viscosity measurements for ovalbumin aqueous solutions were performed over a wide range of concentrations and at temperatures ranging from 50C to 550C in 50C intervals. Analysis of the data showed that the activation energy of viscous flow for ovalbumin DEp(T) fulfils the relation: DEp(T) = DEp – RDpT2, where the parameters DEp and Dp were obtained from a modified Arrhenius formula, and for ovalbumin: DEp = (8.49 ± 0.46)´107 J/mol and Dp = (86.4 ± 5.4) K-1.