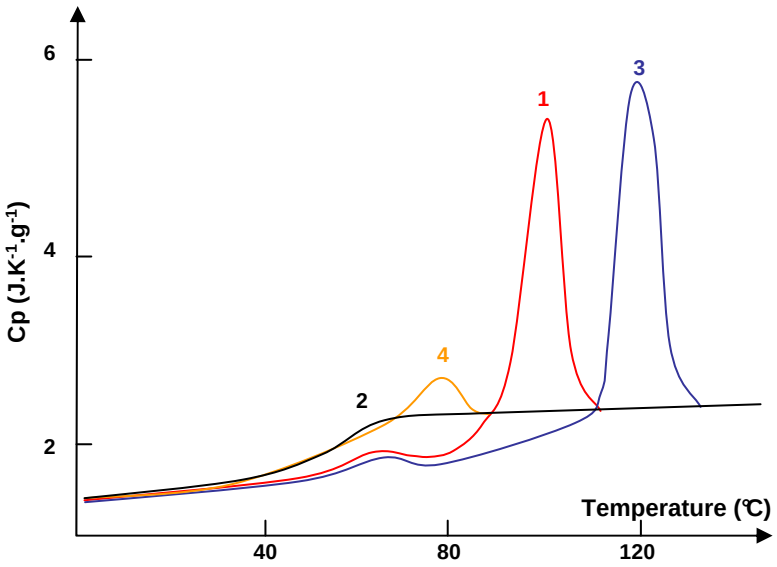
DSC study of melting and glass transition in gelatins

Reference: G. I. Tseretely and O. I. Smirnova, J. of Thermal Analysis, Vol 38, 1189-1201, (1991). Research institute of Physics, St Petersburg State University, 198904, Russia.

Introduction: characteristics of the glass transition in gelatin should depend on its supermolecular structure and will differ for amorphous and crystallized samples. Heat capacity of crystalline and amorphous gelatins at different concentration have been here studied in a wide range of temperature.



Temperature dependence of heat capacity for crystalline (1.4) and amorphous (2) Gelatin III and native collagen (3). Curve 1 is for the Gel A with Qm=28.8 $J.g^{-1}$. Curve 4 for the Gel B with Qm=6.5 $J.g^{-1}$. Concentration of water is 14 % for all samples, heating rate is 3 $deg.min^{-1}$.

Experimental

Curves presented above describe the temperature dependency of the heat capacity for the sample with abound water concentration of 14%. Curve 1 corresponds to the first heating, curve 2 to the second scan. The heating rate in both case was V_h = 3 ℃/min. After the first heating the sample was cooled at the same rate.

Results

A characteristic feature of the first heating curve is the maximum in the strong heat absorption, corresponding to the melting of the gel, which is superimposed on the practically linear temperature dependency of the gelatin heat capacity. Since all the water in the sample is in bound state, the absorption peak corresponding to the melting of the free water at T = O℃ is absent.

Results

Curve 2 in fact corresponds to the heating of the amorphous gelatin and shows an irregular dependence of the heat capacity in the range 30-70℃. The heat capacity changes linearly up to some temperature T1. Above this temperature, the heat capacity abruptly increases up to some temperature T2 after which the linear dependence of the heat capacity on temperature is restored, but with a slightly smaller slope. It can be concluded that there is a heat capacity jump for the amorphous gelatin. This jump can be characterized by the transition temperature Tg, which corresponds to the inflection point of the heat capacity curve, and by the magnitude of Cp, which is given by the difference in heat capacity values extrapolated to Tg along the linear parts of the temperature dependence from higher and lower temperatures.

Instrument

Sensys

(-120℃/830℃)

For more details ask for publication B0818