

THERMAL ANALYSIS T100

DSC of Waters in Several Gels

As starches are heated together with water, they are gelatinized and gelled. It is said that the interaction between water and starch changes when gelling, and bond water is then formed.

Different from bulk water (free water), the bond water shows a melting point below 0° C, and that temperature is known varying according to the size of the interaction. Reported herein are results of measurements where bond water melting points of several starches and gelatins were observed in use of a low-temperature Differential Scanning Calorimeter (DSC).

An aluminum sealing cell was used since it was necessary to prevent evaporation of water in such a measurement. An alumina heated up to 100° C or higher was used for a reference material.

Bond water of flour starch gel

An aqueous solution where flour starch was dissolved at a concentration of approx. 30% was heated at 80° C for two minutes, and the melting peaks of bond water and free water were measured.

The peak at -9.9° C applies to the bond water, and the large peak at -4.2° C applies to the free water. It is seen that the two peaks were clearly separated. Another measurement was taken thereafter, and high reproducibility of the respective peak temperatures was proved.

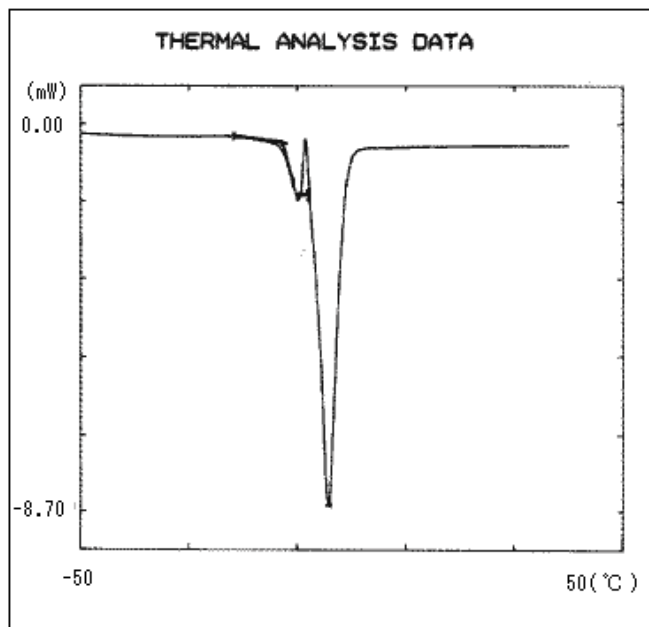


Fig. 1 DSC of free water and bond water in flour starch gel

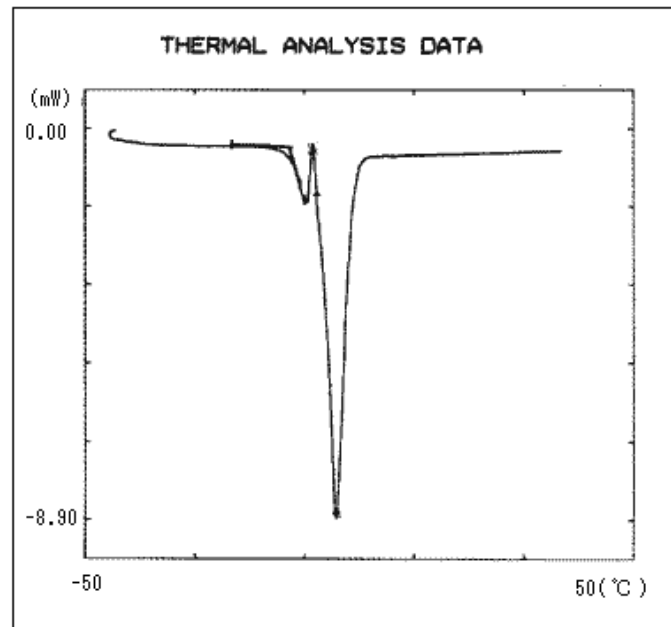


Fig. 2 Repeatability of DSC measurement

Potato starch

Potato starch showed a melting point of bond water at -9.2°C . The temperature was shifted higher by a margin of 1°C in comparison with that of the flour starch.

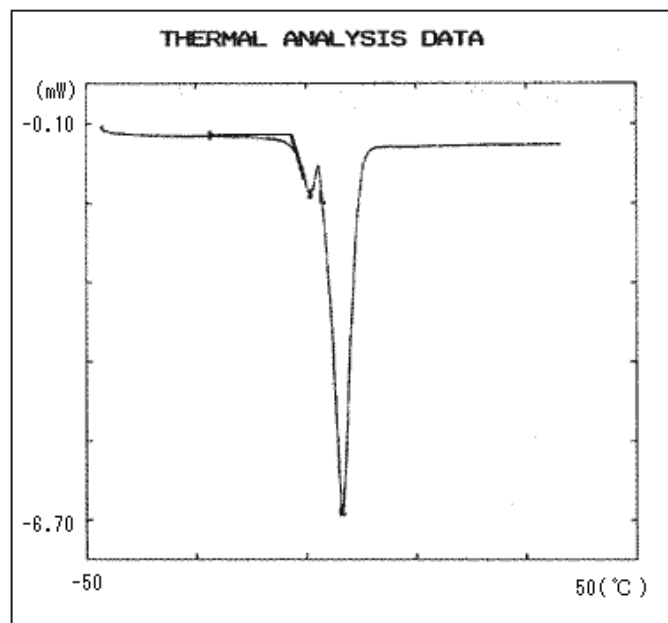


Fig. 3 DSC of waters in potato starch gel

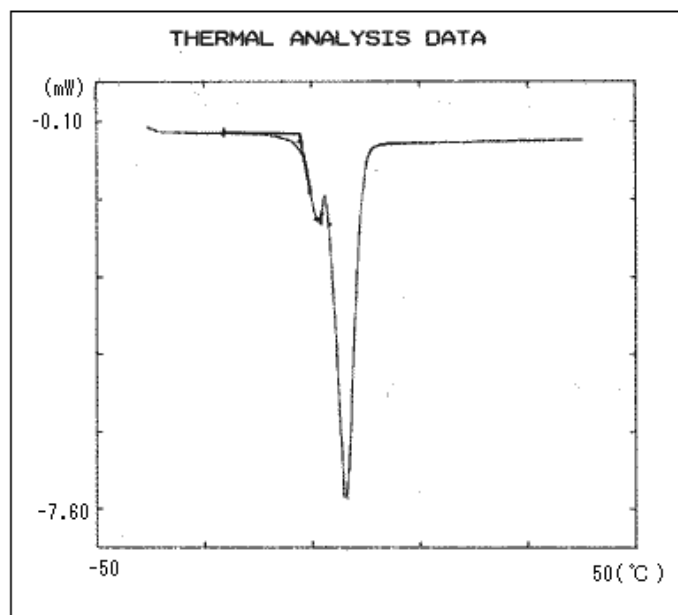


Fig. 4 Repeatability of DSC measurement

Sweet potato starch

Bond water obtained from sweet potato starch melted at -9°C . The melting temperature of bond water was nearly the same as that of the regular potato, but separation from the peak of the free water was poor. Since the melting-start temperature was lower than that of the potato, the peak of the bond water seemed broad. It is that distribution was present in bonding state.

Gelatin gel

As water is added to gelatin and is heated up to 60°C and then cooled, a gel may be produced. A sample at concentration of 30% was measured. Although it was a very small peak, melting of the bond water was observed at -6.0°C .

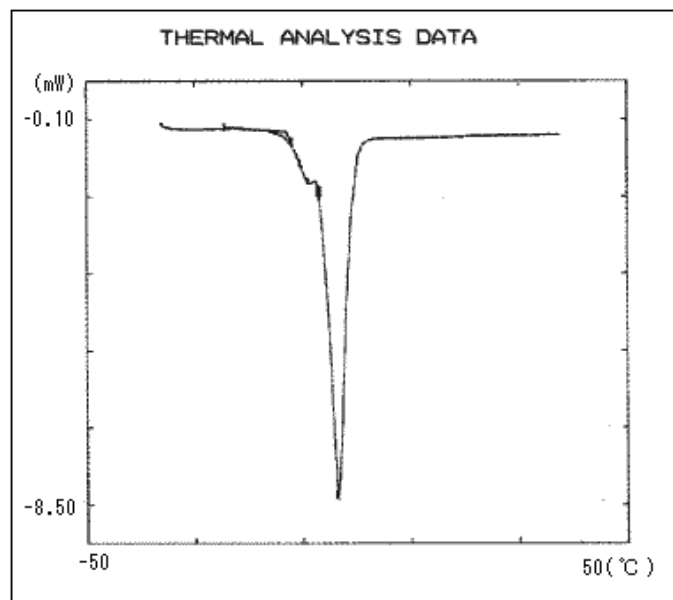


Fig. 5 DSC of waters in sweet potato starch gel

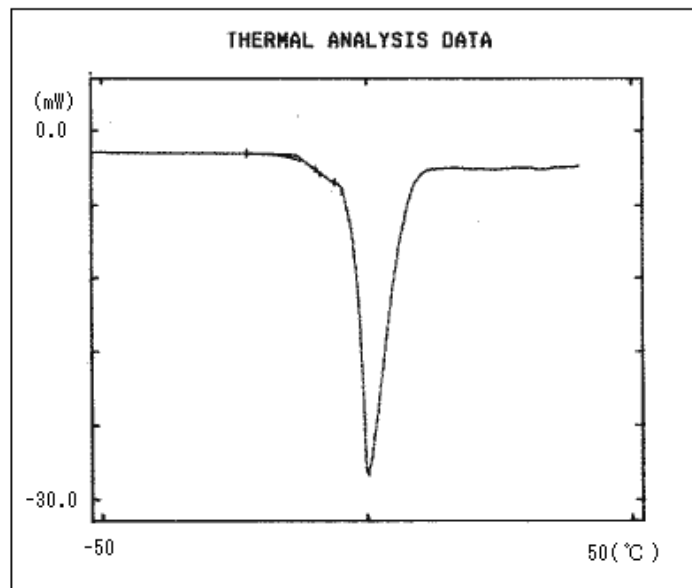


Fig. 6 DSC of waters in gelatin gel

* Please be advised that data obtained before the implementation of the current Weights and Measures Law may be presented in terms of gravimetric unit.



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