かまぼこ製造過程における弾力補強剤の表面疎水性

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Short paper

Surface Hydrophobicity of Gelling Substance

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In the previous paper,[1] we described that egg albumin, isolated soybean protein Al and vital wheat gluten strongly adhered upon heating to the shio-surimi, *viscous salted fish paste*. From the result, these proteins were supposed to bind to the fish muscular proteins during the process of the kamaboko formation. However, there still remains a question whether or not their binding was brought about by the hydrophobic interactions. In order to solve this problem, we investigated the change in their surface hydrophobicity upon heating.

The surface hydrophobicity measuremen[2] and the sort of the gelling substances examined[1,3] were the same at those described previously, After packed into a cellophane tube, 10 m*l* of 1% gelling substance suspension (in 3% NaCl) was heated at 80°C for 10 or 20 min, shaken for 1 h at 4°C after the addition of 1 m*l* of 0.1% SDS (sodium dodecyl sulfate) and dialyzed overnight against 20 m*l* of cold water. The concentration of SDS in the outer liquid was determined photometrically. The surface hydrophobicity was expressed as the absorbance unit as interpreted in the footnote of Table 1. As shown in the Table, the surface hydrophobicity was higher for the unheated cellulose, corn starch, egg albumin, soybean proteins A1 and A2, wheat gluten and shio-surimi, somewhat increased on heating for the corn starch, egg albumin, soybean protein A1, wheat gluten, and shio-surimi, and slightly increased for the chitin and gelatin which showed low surface hydrophobicity before heating. This suggests that the above three proteinous gelling substances, egg albumin, soybean protein A1 and wheat gluten, bind to the muscular proteins by the hydrophobic interactions. The reason why the cellulose, corn starch and soybean protein A2 showed high hydrophobicity whereas they did not adhere to the shio-surimi is considered as follows: for the former two, the small-sized SDS molecules are included within their stereostructure, as the fatty acid is so, as a result, the apparent surface hydrophobicity became high. For the soybean protein A2 (a heat-denatured product of the A1), the hydrophobic amino acid residues are already exposed by the heat-denaturation. For the chitin and gelatin, the hydrophobic interactions would be a little, because the hydrophobicity was extremely low before and after heating.

In any case, however, the binding of the gelling substance to the muscular proteins is not necessary for the gel-strengthing action, as supposed from the fact that agar, *k*-carrageenan, corn starch and soybean protein A2 displayed profitable gel-strengthening.[2]

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Table 1. Change in the surface hydrophobicity of various natural high polymers upon heating at 80°C

High polymers	Surface hydrophobicity*1 Heating time (min)		
	0	10	10
Agar powder	0.022	0.034	0.0
k-Carrageenan	−0.011	−0.052	−0.048
Cellulose	0.211	0.178	0.198
Chitin	0.0	0.022	0.002
Corn starch	0.161	0.272	0.312
Egg albumin	0.109	0.142	0.137
Gelatin	0.0	0.018	0.021
Methyl cellulose	0.011	0.002	0.012
Soybean protein-A1	0.276	0.303	0.274
〃 〃 -A2	0.321	0.261	0.291
Wheat gluten	0.126	0.146	0.152
Shio-surimi*2	0.218	0.332	0.304

*1 Expressed as ao-a, where ao/a is the absorbance of the methylene blue treated without/with the sample.
*2 Made from Alaska pollack frozen surimi (protein concentration: 1%).

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