ULTRA HIGH PRESSURE EFFECT OF EGG ALBUMIN.

By Ryo KIYAMA and TAKAO YANAGIMOTO.

For the purpose of the observation of the behaviour of organic substances under high pressure, the authors carried out experiments on the coagulation of the natural egg-albumin by pressure. P. W. Bridgman[1] reported in 1914 that the white of egg, when it was subjected to hydrostatic pressure transmitted by mercury at room temperature, was completely coagulated for 30 min. under 7,000 kg/cm^2. On the other hand, E. A. Grant[2], R. B. Dow and W. R. Franks used as the sample the Merk impalpable powder egg-albumin dissolved in water, and it was submerged in sterile mineral oil in the pressure chamber to be separated from the pressure transmitting fluid. In consequence, the sample was coagulated under the pressure ranging from 1,000 to 7,500 kg/cm^2, the higher the pressure the more copious the amount of coagulation becomes.

The authors used, as the sample, the white of egg, which was placed in the pressure chamber and compressed directly with piston or by air. The high pressure apparatus used for the present experiments has been already reported[3]. Pressure was applied or released so slowly that the rise or fall of temperature could be neglected.

Egg-albumin is poured into the brass-case (3 cc) in the pressure chamber (Fig. 1), and compressed by air. This experimental results are as follows:

In the pressure range, 1,380～2,620 kg/cm^2 (room temp. 14°C) applied for 1～2 hours the coagulation could not be observed: under 3,880 kg/cm^2 (room temp. 12°C) for 2 hours, a trace of coagulation observed: under 4,980 kg/cm^2 (room temp. 13.5°C) for 2 hours complete coagulation produced, and the sample thus treated had a resemblance to a white half-boiled egg and separated some watery fluid. In three days in the air, it was dried

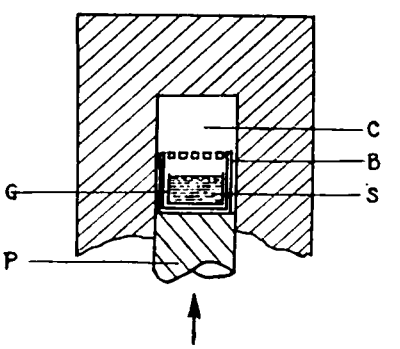

Fig. 1 C: Pressure chamber.
P: Piston.
B: Brass case.
G: Glass vessel.
S: Sample.

1) P. W. Bridgman, *J. Biol. Chem.*, 19, 511 (1914)
2) E. A. Grant, R. B. Dow and W. R. Franks, *Science*, 94, 616 (1941)
3) R. Kiyama, *This Journal*, 19, 1 (1945)

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up and solidified. As for the time effect, a pressure of 4,980 kg/cm² (room temp. 14°C) applied for 1.5 hours produced a coagulation, whose quantity is less than that of the former.

Secondly, the sample of 30 cc egg-white is poured into the C (Fig. 1) and compressed directly with a piston by a handlebar. The experimental results obtained are as follows:

A pressure of 2,960 kg/cm² (room temp. 10.5°C) applied for 2 hours produced a barely perceptible thickening of semitransparence (Fig. 2, B): 4,060 kg/cm² (room temp. 10.5°C) for 2 hours produced a small amount of perceptible stiffened white: while 5,000 kg/cm² (room temp. 12.5°C) for 2 hours produced a coagulation distinctly (Fig. 2, C), and in a short time it separated the water.

Fig. 2, A
The particles are air-bubbles.

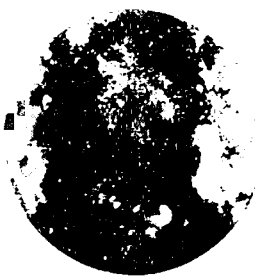

Fig. 2, B
Semitransparent coagulation. The image can not be clearly distinguished from water at the back.

Fig. 2, C
The white part is coagulated and the black water.

For the comparison of the coagulated examples Fig. 2, B and C, the sample of A—pressure not applied—is shown in Fig. 2, A.

At room temperature each sample was dried up with drying material $CaCl_2$ in same desiccator. This results shown in Fig. 3.

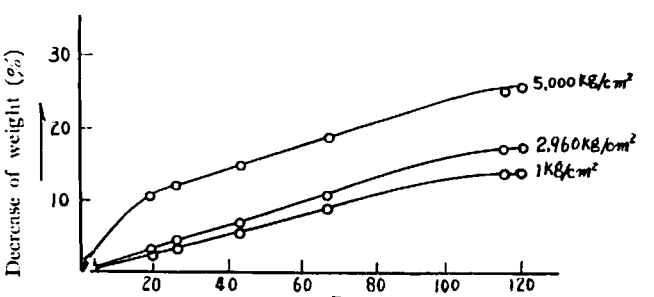

Fig. 3

Under pressure of 3,000 ~4,000 kg/cm², the coagulation is apparent to the naked eye, but from the drying-up curves they are not ascertained. It is considered that in the separation of water these samples could not be distingushed from the natural egg-white for incomplete coagulation. But, in the case of a pressure of 5,000 kg/cm² it is found from the

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standpoint of drying-up process that water is distinctly separated.

The authors express hearty thanks to the Ministry of Education for the Scientific Research Grant.

The Laboratory of Physical Chemistry,
Kyoto University.