Optical Properties of Japanese Millet Jelly

By

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The writer examined indices of refraction, the absorption spectrum and the rotatory dispersion of a Japanese millet jelly, and the results obtained thus far will be given below. The Japanese millet jelly is a mixture of maltose, glucose, dextrose, etc. The jelly used in the present experiment was prepared by a factory in Kyoto, and is known as "Ôgon Ame." It is a very viscous and transparent substance, its colour is slightly yellow like Canada balsam and its specific gravity is about 1.43 at 24°.C.

Indices of Refraction.

Refractive indices of this substance was determined by the method of minimum deviation. The substance was poured in a hollow prism having plane parallel plates on both sides of the refracting angle (62° 25′). This was kept still until the whole got optically homogeneous. It took three days to attain this state. The prism was then placed on the table of a Lang's spectrometer, and angles of minimum deviation were measured for lights of different wave lengths given by a mercury arc lamp, a hydrogen tube and a sodium flame. The refractive indices were calculated by the usual formula, and the values are given in the following table.

Wave lengths.	Indices.
6563 A	1·495
5893 A	1·497

5780 A	1·498
5461 A	1·499
5359 A	1·507
4063 A	1·511

It will be observed that indices of this millet jelly are approximately equal to those of benzine.

Absorption Spectrum.

The jelly shows a slightly yellow colour when examined by transmitted light; this suggests that it absorbs light in the blue violet region of the spectrum. The absorption spectrum of a thin layer of this substance was examined with a small quartz spectrograph. The jelly was put between two quartz plates separated by a wire ring, and light from an iron arc was projected through this cell on the slit of the spectrograph and the absorption spectrum was thus photographed. Exposures of different times were given on one plate one above the other, and positions of maximum absorption were determined. It was observed that a slice of jelly of 2·4 mm. thickness completely cuts off the light from λ 330 μ to the extreme ultra-violet, and slightly absorbs it in the region about λ 450 μ, while a thickness of 0·82 mm. of the *Ame* transmits weakly at the region from λ 225 μ to λ 260 μ and strongly from λ 280 μ up to the visible region.

Rotatory Dispersion.

As the millet jelly is a complex mixture of optically active substances, it has the property of rotating the plane of polarization of incident light. This is simply seen by looking through the substance in a crossed nicol. The amounts of the rotation for lights of different wave lengths were determined by a spectroscope. The light from an arc between iron and cored carbon was projected, through a polarizing nicol, a tube containing the jelly and an analysing nicol, on a slit of a grating spectroscope. On turning the analyser, a dark band entered at one end of the spectrum and passed slowly towards the other as the nicol was rotated, showing that different lights suffer their own amounts of rotation. To determine the positions of this dark band, lines were observed with an eyepiece through the spectroscope and the amounts of rotation for several lights were thus determined. In

the following table, φ gives angles of rotation per 1 mm. of the millet jelly, minus sign indicating that the rotation is laevo.

λ	6439	6122	5893	5857	5590	5270
φ	$-1°\cdot5$	$-1°\cdot7$	$-1°\cdot9$	$-1°\cdot9$	$-2°\cdot1$	$-2°\cdot3$
λ	5189	4878	4580	4440	4300	4230
φ	$-2°\cdot5$	$-2°\cdot8$	$-3°\cdot2$	$-3°\cdot5$	$-3°\cdot7$	$-3°\cdot9$

Thus the Japanese millet jelly rotates the plane of polarization in the negative direction, the amounts of the rotation per 1 mm. being $1°\cdot5$ for H_α.

Summary.

1. Indices of refraction of a Japanese millet jelly were determined, the value for sodium light being 1·497.

2. Absorption spectrum in ultra-violet region was studied.

3. It was found that the substance rotates the plane of polarization to the left, amount of the rotation per 1 mm. thick being $1°\cdot5$ for H_α.

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