The details of the investigation will be published in due course.

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A RELATION BETWEEN REFRACTIVE INDEX AND VISCOSITY

LAGEMANN[1] combined Mott Souder's[2] viscosity relationship with the Lorentz-Lorenz equation and came to the conclusion that for liquids in general, a rough rule is that Mott Souder's viscosity-constitutional constant I is about twelve times the molecular refraction. It has been found that this relationship holds only for aliphatic liquids. The ratio for some simple aromatic liquids is given in the following table:

Ratios of I and M for some aromatic liquids

Compound	I	M	I/M
Benzene ..	249·9	25·96	9·6
Toluene ..	296·5	30·80	9·6
Ethylbenzene ..	344·1	35·37	9·7
o-Xylene ..	346·1	35·48	9·7
m-Xylene ..	344·1	35·64	9·6
p-Xylene ..	346·1	35·70	9·7
Aniline .	280·6	30·29	9·3
Methylaniline ..	328·2	35·24	9·3
Benzylamine ..	328·2	34·15	9·6
Ethylaniline ..	383·8	40·05	9·6
Dimethylaniline ..	383·8	40·41	9·5
o-Toluidine ..	330·0	35·01	9·4
Nitrobenzene ..	310·2	32·37	9·5
o-Nitrotoluene ..	353·8	37·05	9·5
Chlorobenzene ..	290·2	30·90	9·4
Bromobenzene ..	309·2	33·76	9·2

From the above table the conclusion may be drawn that for simple aromatic liquids Mott Souder's[1] I is roughly 9·5 times the molecular refraction.

The values of I have been taken from Mott Souder's paper and those of molecular refraction from Landolt-Bornstein Tabellen.

My thanks are due to Sir J. C. Ghosh for kind advice.

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July 4, 1947.

1. *J. Amer. Chem. Soc.*, 1945, **67**, 498. 2. —, *Ibid.*, 1938, **60**, 154.

TREATMENT OF ALKALINE WATER TO RENDER IT SUITABLE FOR REELING SILK

IN the course of our studies on the quality of raw silk produced in certain silk filatures in South India, some interesting observations have been made. One of the points of considerable scientific and practical importance relates to the influence of water used for cooking the cocoons and reeling the filaments on the quality of silk.

The bore-well water used in one of the silk filatures was found to affect the processing of cocoons and the quality of the silk. Although the cocoons were found to cook much quicker than in other waters, more sericin (silk gum) was dissolved in that water thereby necessitating more frequent change of water in the cooking and reeling basins. The silk fibres, as they were reeled over and hanks were made, were found to retain more moisture, stick together and take longer periods to dry. After drying, hard gum spots and variations in colour, from light greenish yellow to deep greenish yellow, were noticed. These conditions adversely affected the normal properties of the silk, particularly its lustre, feel, evenness, neatness, cleanliness and its winding property. When, instead of the bore-well water, water from other sources, such as from the tank (rain-fed) in the neighbourhood or from the river about two miles away from the filature, was employed the silk reeled was free from the above-mentioned defects.

The unusual features of the bore-well water were its bicarbonate alkalinity and temporary hardness, the permanent hardness being relatively inconsiderable. 100 c.c. of the water required 33 to 40 c.c. of N/50 acid for neutralisation, and the temporary hardness was 18 to 28 parts per 100,000, as observed during different seasons over a period of four years. In view of this observation, further trials were carried out by treating the bore-well water with calculated amounts of mineral acids (such as sulphuric and hydrochloric acids) and organic acids (such as acetic, oxalic and tartaric acids) in order to neutralise the alkalinity of the water or reduce it to that of the river water which was found satisfactory for silk reeling. The results of these studies confirmed the above observations and indicated that a simple and cheap method of treating the bore-well water was just to neutralise its alkalinity or reduce it to a minimum by adding sulphuric acid (commercial grade) and vigorously stirring the water by means of an efficient blower so that no free acid was left in the water. Thus it was observed that the quality of the silk reeled in the bore-well water after treatment with sulphuric acid (0·75 c.c. of concentrated acid per gallon of the water for bringing down the alkalinity from 37 to 9 in terms of N/50 acid for 100 c.c. of the water) was comparable to that reeled in the river water (100 c.c. of this water required 8·9 c.c. of N/50 acid for neutralisation).

The practical application of the above findings under the working conditions of a filature presents some fresh problems. If the water in the cooking and reeling basins is treated, the beneficial effect of neutralisation lasts for only a short time. Unknown quantities of fresh alkaline salts are brought in through the 'creeping' of water with the steam used for the heating. The water carried with the steam contains alkali carbonate formed through the decomposition of the alkali bicarbonate by heat. This is now sought to be remedied by the introduction of suitable traps and other devices which will introduce only dry steam. Steam jacketing of the basins would also be an elegant way of dealing with this difficulty.

If the discolouration of the silk is not material (depending upon its use) and gum spots alone are to be minimised, this can be done by drawing the silk thread through a groove containing some vaseline or other grease prior to winding round the hank. This has already been tried successfully in one filature.

A detailed account of the work including the quantitative data relating to the quality of the reeled silk will be published elsewhere.

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THE CYSTINE AND METHIONINE CONTENTS OF COMMON INDIAN FOODSTUFFS

No detailed work on the analysis of foods for their contents of methionine and cystine in common Indian foods has yet been done. While the cystine content of some food proteins has been determined, very few have been analysed for methionine. The reported cystine values are on certain fractions of isolated proteins. The whole proteins of foods have not been taken into account during the analysis except for certain values reported by Chitre and Keni.[1] This is because no satisfactory methods existed, till recently, for analysing the whole proteins of foods for their cystine and methionine contents. Recently, however, reliable methods for their analyses have been developed. Apart from the microbiological method, Evans[2] has developed a wet digestion method for analysis of these constituents. The method consists in analysing the food-stuff for (*i*) Total sulfur, (*ii*) Inorganic sulfur and (*iii*) Sulfur oxidised to sulfate by nitric acid.

The above method was used in the following determinations. From the cystine and methionine sulfur values the actual amino-acid contents were calculated by using the appropriate conversion factors (3·747 for cystine and 4·651 for methionine). The combined nitric and perchloric ecid digestion method[3] was used for the determination of total sulfur.

The final data about the cystine and methionine contents of the foods are tabulated below.

It will be seen that among the cereals, rice contains a high percentage of methionine. The cystine percentage is about the same in all cereals. Except for Dolichos and horsegram, the total percentage of sulfur amino-acids in all other pulses is about the same. Green-gram and the cowpea contain a large proportion of methionine. Among oilseeds, soya bean and sesamum contain a large amount of total sulfur and a fairly large proportion of methionine also. About three-fourths of the total sulfur in groundnut is, however, in the form of cystine only.

Table I

Cystine and Methionine Content of Some Indian Foodstuffs

(per cent. of air dry samples)

Foodstuff	Protein	Cystine	Methionine
I. *Cereals*			
*(i) Rice (*Oryza sativa*)	6·9	0·27	0·31
(ii) Ragi (*Eleucine coracana*)	7·1	0·23	0·28
(iii) Cholam (*Sorghum vulgare*)	10·2	0·24	0·21
(iv) Wheat (*Triticum vulgare*)	11·7	0·28	0·27
II. †*Pulses*			
(i) Bengal gram (*Cicer arietinum*)	17·3	0·53	0·20
(ii) Green gram (*Phaseolus ra[illegible]s*)	22·3	0·49	0·42
(iii) Black gram (*Phaseolus mung*)	23·1	0·51	0·32
(iv) Tugar Dhal (*Cajanus indicus*)	22·2	0·59	0·32
(v) Dolichos (*Dolichos lablab*)	23·8	0·32	0·31
(vi) Horsegram (*Dolichos biflorus*)	21·3	0·42	0·14
(vii) Cow pea (*Vigna catiang*)	24·1	0·45	0·43
III. *Oilseed cakes*			
(i) Groundnut (*Arachis hypogea*)	51·2	0·76	0·26
(ii) Soya bean (*Glycine hispida*)	50·8	1·01	0·58
(iii) Sesamum (*Sesamum indicum*)	33·1	1·12	0·59
(iv) Cotton seed (*Gossypium barbadens*)	24·2	0·89	0·68
(v) Cocoanut (*Cocos nucifera*)	20·3	0·80	0·29

* Polished rice was used.

† The pulses were powdered along with the skin.

If the amino-acid contents are expressed as per cent. of the protein content, the cereals are the best sources of methionine while the pulses and the oilseed cakes constitute the richest sources of cystine.

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