TABLE 3.

Internal Latent Heat of Vapourisation (cals.).

Substance	T	$\sigma \times 10^8$	α	L_i calc. (3)	L_i obs.
He	2·3	4·00	0?	19·4	17·6
H_2	20·0	4·05	·014	169	177
Ar	87·1	4·05	·0046	1280	1326
N_2	63·1	4·23	·0048	1230	1330

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Efficiency of the Open Pan System of Making White Sugar.

IN these days of manufacturing sugar with the help of all modern appliances, still there are persons who think it worth while trying to improve the open pan system of manufacturing sugar.

The Mysore Department of Agriculture has done a lot of work in this direction during the years 1904-05 and 1906-07 and published the results obtained in the reports of the Agricultural Chemist for these years. The efficiency of the process on a commercial scale was tested on a private estate in 1911, and a summary of the results obtained was published.[1] Recently Sethi and Sarkar have published a note[2] on the single pan method of manufacturing 'Khandsari' sugar.

While the work was conducted on a commercial scale in 1911, a total quantity of 25,550 lbs. of juice were boiled and 2168 lbs. of sugar were recovered from it. Calculated on the quantity of sucrose contained in juice only 48·2% of it was recovered as sugar. Just for comparison, the proprietor of the estate boiled 11,850 lbs. of juice in his own pans and obtained 2,419 lbs. of jaggery from it. The weight of jaggery obtained worked out to 20·4% on the weight of juice boiled while the recovery as sugar was only 8·8%, *i.e.*, less than 45% of the weight of jaggery. In the process followed by Sethi and Sarkar the recovery of sugar from juice is only 8·28% against a recovery of 8·8% by the Mysore process. Calculating the recovery on the amount of sucrose contained in juice the recovery by the Mysore process was 48·2% against 46·8% by Sethi and Sarkar.

It is worth while considering whether sugar making by the open pan system will pay at all in competition with modern sugar factories working in India itself. With improved methods of milling and manufacture, modern sugar factories can and do surely recover much more sugar from cane than the open pan system ever can with the milling and boiling appliances at disposal.

Whether it is worth while spending further time and money on trying to improve the open pan system is a matter for serious consideration.

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July 3, 1934.

[1] *Journ. Mys. Agric. & Exptl. Union*, 1924, **5**, No. 3.

[2] *Agriculture and Live-Stock in India*, **3**, Part V.

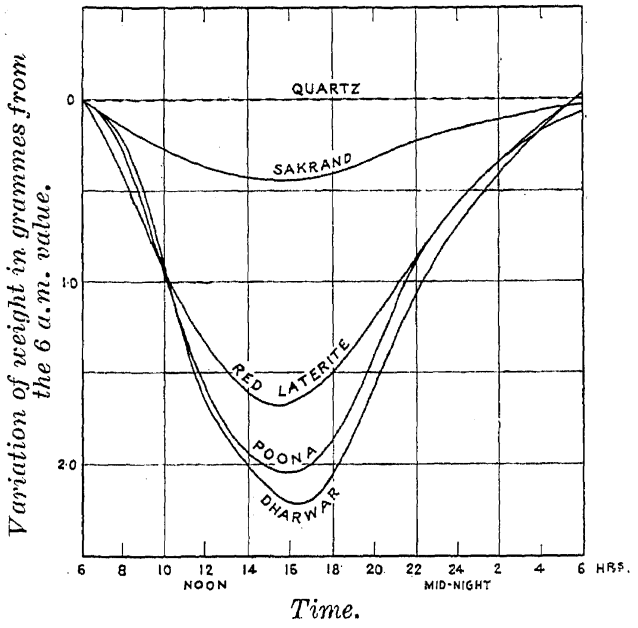
The Variation of Moisture in the Surface Layer of the Soil in Relation to the Diurnal Variation of Meteorological Factors.

IN a recent note[3] one of us referred to the decrease in the pressure of water vapour with height above bare soil during day and the reverse phenomenon at night. These effects were observed daily at Poona during the clear season, November to April, when the surface layer of the soil is dry and contains only hygroscopic moisture. Experiments with samples of the surface soil exposed under natural conditions (in the open) showed that there was appreciable loss of weight by evaporation during the day and that most of the moisture lost by day was regained from the atmosphere during the night. These results readily explain the humidity observations, for, during the day, owing to insolation and consequent rise in temperature, the soil surface gives up moisture to the atmosphere, whereas during the night it absorbs moisture from the air layers above it and thus reduces the vapour pressure in these layers.

Soil samples from a few other centres were next exposed in a similar manner and their weights determined at two-hourly intervals. The weights of the soils were of the order of 60 grammes, the area of cross-section of the vessels used being 30 square centimetres. Observations of air temperature, humidity, soil temperatures, wind

[3] *Curr. Sci.*, 1934, **2**, 445.

velocity and intensity of radiation from the sun and sky received by a horizontal surface were also made simultaneously. The figure shows the variation in the weights of



the different samples from 6 A.M. of 1-6-1934, to 6 A.M. of 2-6-1934, the variations being expressed with reference to the weight of each sample at 6 A.M. It is interesting to note the very high amplitudes of the evaporation during day and the absorption during night in the case of soils from Poona and Dharwar. Soil from Sakrand showed a moderate variation. The weight of each sample is maximum at the minimum temperature epoch (about 6 A.M.) and minimum at the maximum temperature epoch (about 2 P.M.). A sample of quartz powder, however, showed hardly any variation. The responses of different soils to the diurnal variation of meteorological factors appear to offer an interesting method of studying the hygroscopic properties of different soils and their influence on the micro-climate.

Further work with different soils is in hand. The results obtained so far are being discussed fully elsewhere.

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Refractive Index of Thin Films of Potassium.

IN recent papers, Zener and Kronig have given a quantitative explanation of the remarkable optical properties of alkali metals in the ultra-violet observed by Wood [1] In particular, Kronig[2] has calculated the refractive index of potassium for different wave-lengths, and compared with the values deduced from Wood's measurements on the change of amplitude and phase on reflection from thin films of potassium. Though the calculated values are of the same order of magnitude as Wood's observed values, the numerical agreement is far from satisfactory; the calculated values being consistently lower, being usually about one-tenth to one-half.

The purpose of the present note is to suggest a probable explanation for this discrepancy. The experimental values of Wood refer to a thin film of material, whose thickness is of the order of the wave-length of light, whereas the computations of Kronig refer to an extended medium. It is well known from measurements on the conductivity of thin metallic films that as their thickness is reduced they show an *abnormal* increase in resistance. This has been explained recently by A. Jagersberger[3] in the following manner. As the thickness of the film becomes so small that it is comparable with the electronic mean free path, the effect is as though there is a decrease in the number of free electrons which are responsible for conduction, and hence the abnormal increase in resistance. The discrepancies between Kronig's calculated values which refer to an extended medium, and Wood's experimental values which refer to thin films may probably be attributed to the same cause. On calculation, we find that a fit between the above calculated and experimental values can be obtained if the "effective" number of free electrons per c.c. in Wood's thin potassium films are taken to be about 50% of the actual number. This is of the same order of magnitude as is necessary to explain the anomalous resistances of thin films.

From this point of view, measurements on the resistances of thin films of potassium obtained by Wood's method would be very desirable.

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[1] *Phys. Rev.*, 1933, **44**, 353.
[2] *Nature*, 1934, **133**, 211.
[3] *Zeit. f. Physik.*, 1934, **87**, 513.