

LETTERS TO THE EDITOR

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HEAT CONDUCTIVITY AND MOLECULAR WEIGHT OF LIQUIDS

THE author¹ has shown previously, after Osida,² that the heat conductivity of a dielectric liquid is determined *inter alia* by the vibration frequency of its molecules. The frequency of vibration of a particle, executing monochromatic vibrations about its position of equilibrium in a space lattice, varies inversely as the square root of its mass.^{3,4} It is of interest to find out, therefore, whether any such relationship exists between the coefficient of heat conductivity, K, and the molecular weight, M, of a liquid.

K varies with temperature, t .⁵⁻⁷ It is necessary, therefore, for the above investigation, to accumulate data on K for different liquids at a corresponding temperature, e.g., the boiling point. Further, since various methods of measurement of K give slightly different values, data obtained by any single method are only strictly valid. Measurement of K at the boiling point is not possible. The heat conductivity at the boiling point $K_{B.P.}$ for a particular liquid can, however, be obtained from values at two (different) temperatures, assuming a linear relationship between K and t . In the accompanying table are shown the boiling points (B.P.), M, \sqrt{M} , $K_{B.P.}$ (obtained from Bridgman's data⁶ at 30° and 75° C.) and $K_{B.P.}/\sqrt{M}$ for twelve different liquids of widely varying M and K. The molecular weights M are those of the vapours.

As will be evident from the last column in

the table, the product $K_{B.P.}/\sqrt{M}$ is approximately a constant, except in the case of water. It has a mean value of 0.0030 for eleven liquids with M and $K_{B.P.}$ varying respectively from 32.0 to 156 and 0.000496 to 0.00261. That the heat conductivity of a liquid, like the frequency of vibration of its particles, should be an inverse function of the square root of its molecular mass is significant. The departure of water from this simple generalization requires further investigation.

Liquid	M	\sqrt{M}	B.P. (° C.)	$K_{B.P.} \times 10^3$	$K_{B.P.}/\sqrt{M}$
Water ..	18.0	4.24	100	1.595	0.006769
Methyl alcohol ..	32.0	5.657	64.7	0.496	0.002805
Ethyl alcohol ..	46.1	6.790	78.3	0.415	0.002818
Acetone ..	58.1	7.622	56.5	0.414	0.003156
Isopropyl alcohol ..	60.1	7.752	82.2	0.362	0.002806
Normal pentane ..	72.1	8.491	36.2	0.319	0.002709
Ether ..	74.1	8.608	34.6	0.328	0.002823
Normal butyl alcohol ..	74.1	8.608	117.5	0.383	0.004297
Carbon disulphide ..	76.1	8.724	46.2	0.375	0.003271
Isoamyl alcohol ..	88.1	9.386	131	0.341	0.003291
Ethyl bromide ..	109	10.44	38.4	0.284	0.002965
Ethyl iodide ..	156	12.49	72.3	0.261	0.003260
				Mean	0.003010

My thanks are due to Prof. S. S. Joshi for his kind interest in the work.

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March 15, 1948.

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A NOTE ON THE OCCURRENCE OF FREE SULPHUR IN DRUSES AND CAVITIES IN THE MICA-BEARING PEGMATITES OF GOSAVID, TIRUVUR TALUK

DURING recent field work in the mica-bearing regions of Tiruvur Taluk (Kistna District) an interesting occurrence of free sulphur in druses and cavities was noticed in a pegmatite vein near Gosavid, a village which is about 13 miles from Yerrupalayam Railway station on N.S. Rly. The country rocks of the area are khondalites consisting of garnetiferous-sillimanite gneisses, mica-schists, and quartzites into which are intruded charnockites, granites, and pegmatites. The pegmatites which are intrusive into the schists are disposed parallel to the plane of foliation of the latter. They carry workable mica and have been trenched by prospectors in a number of places. A zone of narrow central quartz core is surrounded on either side by a zone of felspar in the pegmatite, and in the quartz are a number of small drusy cavities. In some of the druses a yellow powder having the smell of sulphur was observed. On closer examination it proved to be sulphur in the free state. This powder was filling the druses which were up to an inch in width and up to half an inch in depth.

So far as we are aware, free sulphur has not been reported from any of the Indian pegmatites. The minerals comprising the pegmatites are quartz, felspar, muscovite, biotite, apatite, tourmaline and chalcopyrite. Chalcopyrite is very subordinate and occurs as sporadic stringers in the associated quartz.

The occurrence of free sulphur in a pegmatite is peculiar, and is of great academic interest. The trench was under excavation during the period of the survey of the area. No gun powder or dynamite were used for opening out the trenches and the excavation was done entirely with crowbars and wedges. The pegmatite vein up to this deposit was disintegrated and blocks of the vein material could be easily dislodged and removed without blasting. The druses with free sulphur occur at a depth of about 25 feet from the surface and in the zone of vadose circulation. Chalcopyrite stringers and lenses occur within about a foot from these druses.

One possibility which suggests itself is to consider this occurrence of sulphur as having been deposited as a sublimate in pneumato-

lysis. The association of chalcopyrite in close proximity is significant, as it points to the presence of sulphides in the emanations. Since, however, the sulphur was found within the limits of meteoric circulation in a vein which was highly fractured and disintegrated, the possibility of its having been derived from chemico-organic decomposition of the chalcopyrite cannot be ignored. Alteration of sulphide minerals by meteoric water is too well known to require elaboration. In a recent paper Schouten¹ recognises the possibility of the role of special bacteria in the reduction of sulphur-bearing minerals. It is conceivable that the chalcopyrite might have undergone oxidation by meteoric waters to a sulphate, and sulphur-reducing bacteria might have altered it to free sulphur, the possibility of which is indicated by Schouten,¹ Ganapathi² and Iya and Sreenivasaya.³ If chemico-organic origin of this sulphur is admitted, it is not improbable that the druses were themselves originally filled with chalcopyrite. The main purpose of this note is to record the occurrence of free sulphur in mica-bearing pegmatites of Gosavid, Tiruvur Taluk. Alternative suggestions have been put forward to account for their origin.

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SYNTHESIS OF $\beta\beta$ -DIMETHYL, $\beta\beta$ -DI- ETHYL ADIPIC AND CYCLOHEXANE AND CYCLOPENTANE-1-ACETIC-1- PROPIONIC ACIDS

BAYER's strain theory suggests, under conditions, where glutaric and β -substituted glutaric acids yielded a cyclopropane ring, the adipic and corresponding substituted adipic acids should facilitate the formation of cyclobutane ring; but Thorpe Ingold valency deflection hypothesis points to the contrary. The present investigation was undertaken with the idea of verification of either view, which field remained unexplored, for the synthesis of such substituted adipic acids was attended with considerable difficulty. The usual methods for the conversion of a lower dibasic acid into a higher one fail when applied for the preparation of substituted adipic acids. It was, therefore, proposed that attempts to introduce a methylene group in one of the free arm chains carrying carboxyl groups in glutaric acid (β -substituted), be made. A method was devised on the lines, based on the conversion of ortho-nitrobenzoic acid into ortho-nitrophenyl acetamide,¹ and experiments were started to convert (a) $\beta\beta$ dimethyl, (b) $\beta\beta$ diethyl glutaric acids into corresponding adipic acids and (c) cyclohexane, (d) cyclopentane-1-1-acetic acids into corresponding cyclohexane cyclopentane-1-acetic-1-propionic acids. The acids