

may be attributed to the different impurities such as iron and zinc which can only be removed with great difficulty. Special care must therefore be taken to purify mercury. It is always better to get it from one of its chemical compounds which can be obtained in a higher state of purity. In the present investigation mercury was obtained from Kahlbaum's extra pure compounds of mercury. All the necessary precautions were taken to get it in as pure a condition as possible.

*Specific and Atomic Susceptibilities of Mercury.
Experimental Values.*

Authors	Specific susceptibility $-X \cdot 10^6$	Atomic susceptibility $-X_{at} \cdot 10^5$
Honda and Owen ..	0.19	38.1
Owen	0.184	36.9
Davis and Keeping ..	0.189	37.9
E. Vogt	0.168	33.7
Bates and Tai ..	0.1676	33.6

Present Authors' Observation.

1. Purified and distilled ..	0.157	31.5
2. Obtained from extra pure oxide of mercury ..	0.1716	34.4
3. Obtained from extra pure mercuric nitrate ..	0.1729	34.7
4. Obtained from extra pure mercuric benzoate ..	0.172	34.5
J. S. Shur ..	0.389	78.0 vapour

Theoretical Value.

Calculated according to Slater's method..	0.42	84.6
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The specific and atomic susceptibilities of purified and distilled mercury are rather low when compared with other experimental values. The values obtained from Kahlbaum's extra pure compounds are, however, almost the same as obtained by E. Vogt, Bates and Tai. The higher specific and atomic susceptibilities obtained by Shur

in the vapour state and their close resemblance with the theoretically calculated values by Slater's method, show that mercury is monoatomic in the vapour state. The lower diamagnetic values of mercury in the liquid state may be attributed to the polyatomic molecule of mercury. This can further be explained on the assumption that the free electrons in the outer orbit of mercury may be interchanging between the component atoms to form an aggregate of complex or polyatomic mercury. It is rather curious to note that the atomic diamagnetic values in the liquid state closely correspond to the susceptibility constants of mercury in the divalent and extremely covalent state. Considering the interesting work so far accomplished and the fact that many important conclusions are derived from it, it appears desirable to investigate mercury in a spectroscopically pure state also. Further work will be reported on this subject shortly.

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¹ Bates and Tai, *Proc. Phys. Soc.*, 1936, **48**, 795.

² Honda and Owen, *Ann. Phys. Lpz.*, 1910, **32**, 1027.

³ Owen, *ibid.*, 1912, **37**, 657.

⁴ Davis and Keeping, *Phil. Mag.*, 1929, **7**, 145.

⁵ E. Vogt, *Ann. Phys. Lpz.*, 1932, **1**, 14.

⁶ Bates and Tai, *loc. cit.* under 1.

⁷ J. S. Shur, *Nature*, May 8, 1937.

The Diamagnetic Susceptibility of Some Complex Ions.

SEVERAL investigators have determined the diamagnetic susceptibilities of simple and complex ions.¹ The experimental values have been compared favourably with the theoretical estimates made by Pauling, Stoner, Slater and Angus.¹ Most of the magnetic measurements have been made with the substances in the solid state. The influence of the deforming power of ions on each other when they combine to form compounds does not seem to have been taken into account in the estimation of ionic susceptibilities. This aspect has been considered at some length by Varadachari² and Subramaniam¹ from this laboratory. Our method of studying ionic deformation which

follows from their experimental work is to study the susceptibilities of salts in the solid and dissolved states. The predominant factor in the change of susceptibility on solution is ordinarily the release of ionic deformations.

From these points of view, a study has been made of the susceptibilities of some formates and acetates, nitrites and nitrates, iodates and selenites in the state of solid and in solutions in water. Formates and acetates show very small changes of susceptibility when dissolved in water. Investigations with iodic acid and iodates show that the specific diamagnetic susceptibility is greater in the solid state than in the state of solution. On comparing these results with Raman effect data obtained by Venkateswaran,³ it looks most likely that the observed changes should be due to dissociation of iodic acid and iodate molecules in water but the matter seems to require further investigation. Nitrates show small changes in susceptibility when dissolved in water while nitrites show a comparatively large increase. Magnetic data support the view that the nitrogen in the nitrite ion is trivalent. In the case of selenites, the diamagnetic susceptibility increases when they are dissolved in water. This result supports quantitatively Venkateswaran's⁴ inference that in the solid selenious acid, selenium is hexavalent while in aqueous solutions, it becomes tetravalent.

The following table gives the values of the ionic susceptibilities obtained from a careful study of over 16 salts in the solid and dissolved states:—

Ion	Ionic diamagnetic susceptibility.		
	Calculated from solid data	Calculated from solution data	Kido ⁵
(COOH) ⁻	17.3	17.6	20.2
(CH ₂ COOH) ⁻	29.8	30.2	31.4
(IO ₃) ⁻	47.3	41.1	52.2
(NO ₂) ⁻	8.0	11.4	15.0
(NO ₃) ⁻	18.1	19.5	20.1
(SeO ₃) ⁻⁻	44.9	52.7	47.5

These considerations point to the necessity of studying salts in aqueous solutions before definite inferences could be drawn regarding the susceptibilities of the ions concerned. Full details will be published elsewhere.

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¹ These [references are given in Subramaniam, *Proc. Ind. Acad. Sci.*, 1936, 4, 404.

² *Ibid.*, 1935, 2, 161.

³ *Ibid.*, 1935, 2, 119.

⁴ *Ibid.*, 1936, 3, 533.

⁵ *Sci. Rep. Tohoku Imp. Univ.*, 1933, 22, 835.

Dispersion of Sound Velocity in Liquids.

THE question of dispersion of sound velocity in liquids has assumed great importance in view of recent reports by several physicists,¹ of high absorption of sound in liquids at ultrasonic frequencies. But the experimental results² so far obtained are indecisive, and it is obvious, therefore, that an arrangement should be sought for, wherein errors likely to alter the velocity ever so little, are completely eliminated, before one could be certain of any dispersion.

An oscillator set was constructed with two sets of coil and condenser to give roughly 3.5 and 14.5 megacycles independently of each other and with only by a change of switches. But the circuit connecting the piezo-quartz was the same in both the cases, so that the crystal once immersed in a liquid was left undisturbed throughout the entire operation of obtaining the spectra at the two frequencies. In this method, the arrangement including the optical system was not altered, thereby eliminating all errors incidental to such disturbances.

The two diffraction spectra were taken on the same photographic plate; no error arises on account of the measurement of the distance between the fringes. The temperature of the liquid was measured accurately to one-tenth of a degree Centigrade before and after each experiment, and no fluctuation in temperature by even the above amount was noticed. The lower and higher frequencies were determined