

with increasing pressure is taken as showing that it contains molecular complexes. The speed decrement with pressure becomes greater as temperature is lowered. To compare with the observations we have considered a model in which the complexes are all taken to be dimers. This model will be represented by straight lines in the plot since the speed of sound varies as the square root of gas density and dimer concentration will vary as its square. The fractional dimer concentration is measured by the slope of these lines and at 50° C and 90% saturation we find a value of 8×10^{-3} . The temperature dependence of the slope is a measure of the dimer binding energy for which a value of 0.5 ± 0.1 eV per dimer molecule is found.

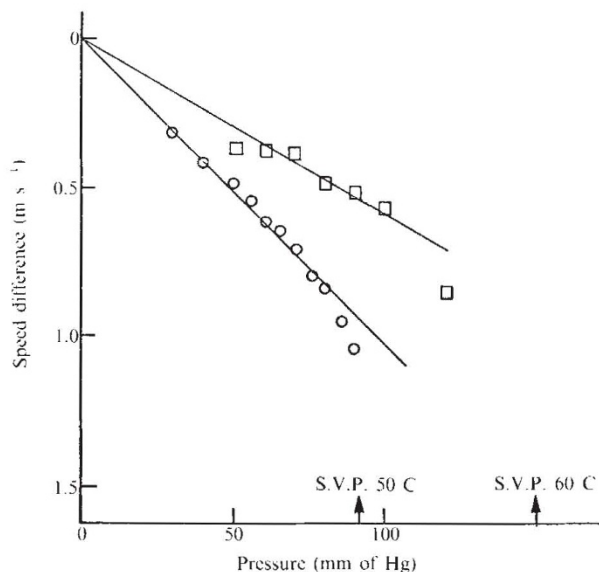


Fig. 1 Speed of sound in water vapour. The ordinate is the difference between the observed speed and the speed, appropriate to the temperature, extrapolated to zero pressure. □, 60° C; ○, 50° C.

The model used for analysis is only a first approximation and is probably oversimplified: the values also are tentative and subject to confirmation when the measurement technique can be refined, but these speed of sound measurements clearly show molecular complexity in water vapour at temperatures approaching tropospheric values.

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Light Sensitivity of Tests for Cadmium on Ceramic Tableware

MANY countries, including Ireland, Great Britain and the United States, have introduced national standards aimed at controlling the amount of lead and cadmium which can be leached into food from ceramic tableware¹⁻³.

Most countries including those mentioned above favour a cold test while others, notably Denmark, favour a boiling test of shorter duration⁴. The cold test usually involves filling the article with 4% acetic acid and allowing it to stand for 24 h. Limits are set for the concentration of lead and cadmium in the resultant leaching solution. In the Irish and United States tests, the limits are set at 7 p.p.m. for lead and 0.5 p.p.m. for cadmium. The British Standard (BS) for ceramic flatware is 20 and 2 p.p.m. for lead and cadmium respectively, those for hollow ware below 1,100 ml are 7 and 0.7 p.p.m. for lead and cadmium respectively and the BS limits for hollow ware of 1,100 ml and above are 2 and 0.2 p.p.m. for lead and cadmium respectively. The method of test is, however, very similar to that used in the American and Irish tests.

The series of experiments reported here were carried out on whiteware pottery with a lead-bearing glaze on which was applied a multicoloured silk-screen onglaze pattern, known to contain cadmium. A series of plates, decorated, heat treated and tested at room temperature in a similar manner in the absence of light, gave values of 0.17 ± 0.06 p.p.m. for cadmium. But, if plates from a similar batch were tested under daylight conditions or under artificial light at similar temperatures, results up to 2.5 p.p.m. could be recorded depending on the duration, intensity and wavelength of the radiation allowed to fall on the plates in the 24 h period. The results also indicate that significant leaching can occur in brightly lit conditions when the 4% acetic acid solution is replaced by deionised water as the leaching solution. Results of 0.5 p.p.m. have been recorded, once again depending on the duration and intensity of the light in the 24 h period.

Throughout the experiments no change was noted in the results for the amount of lead leached, which remained at 1.2 ± 0.4 p.p.m. When distilled water was used, no lead was leached into solution.

There is also evidence which indicates that the boiling test used in Denmark can be similarly light sensitive.

We suggest that, in the case of the series of results reported here, the light sensitivity of the test is due to the photo-oxidation of insoluble cadmium sulphide to soluble cadmium sulphate. Cadmium sulphide has been shown by X-ray diffraction to be present in the onglaze decoration. Clearly, articles may pass or fail the various national specifications according to the light conditions in which the test is carried out. Further details of the results quoted here will be published elsewhere.

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