

[23] used. The results presented are therefore for the exact values of references [22] and [23]. The enhancement factor for a saturated salt solution in air is not known precisely. Analysis of the factors involved indicate that at one atmosphere pressure or less, the difference between the enhancement factor over a saturated salt solution and over pure water is negligible. That is not the case at high pressures. The data presented are therefore considered valid near or below one atmosphere total pressure. If saturation vapor pressure values other than those given by Wexler [22] are used, the relative humidities should be multiplied by the ratio of these saturation vapor pressures to those of Wexler.

Many compilations of non-critically evaluated data on the equilibrium humidity of saturated salt solutions exist [24-38]. Table 3 is a comparison of values from this work and corresponding values taken from five of these other compilations at four temperatures. Of the listed compilations, only this work (column a) and Hickman's work (column d) give the sources of the data. Hickman's values (in column d) were directly copied from his cited references without modification. None of the compilations other than ours (column a) gives estimates of uncertainty. Therefore, one would logically conclude that the authors of those compilations consider their values to be uncertain only in the last figure presented. It is also likely that some of the values in one compilation came from the same sources as the values in other compilations—such a relationship appears to exist between column b and column d.

If we assume an uncertainty of 1/2 of the last digit in the values given in these other compilations, and if we add that uncertainty to the estimated uncertainty for the corresponding values in column a, we find that the values in column a (the results of this work) agree with the values in at least one of the other compilations to within this composite uncertainty at all points, except for:

Potassium carbonate at 10 °C
Sodium bromide at 20 °C
Ammonium chloride at 30 °C
Potassium bromide at 10 °C, 20 °C, and 30 °C
Potassium chloride at 10 °C, and 20 °C

It should be noted that this comparison of compilations is over a limited temperature range and for only 17 of the 28 salt solutions evaluated and collated in this paper.

6. Appendix

In all cases, the most fundamental measurements presented were used to calculate the actual relative humidity obtained by each investigator for each datum. No attempt was made to evaluate purity of water or solute or its effect in any investigation.

As a first step, all temperatures were converted from the temperature scale in which the data were presented into IPTS-68 temperature equivalents. Where the temperature scales were not given, a judgment was made as to the most likely temperature scale used, based on the date of the research.

Likewise, where vapor pressures based on vapor pressure equations or tables were given, these were converted to new

vapor pressures based on the Wexler formulation. In the case of reported relative humidities based on dew-point measurements, the dew-point temperature was reconstructed from a knowledge of the vapor pressure equation used. From the reported control temperature and the reconstructed dew-point temperature a new relative humidity was calculated using the Wexler and Greenspan equations for vapor pressures and enhancements factors, respectively.

Where the isopiestic method was used with sulfuric acid as the isopiestic solution, the values of Shankman [39] for sulfuric acid activity were used to determine the relative humidity of the saturated salt solution. This was done (1) for consistency, because many of the researchers had done likewise; (2) because Shankman described his experimental work in sufficient detail to enable us to judge its quality and to estimate the uncertainty in his work; and (3) his values appeared to be the most accurate available.

In determining estimates of total uncertainty for each datum, the uncertainty was taken as the square root of the sums of individual uncertainties (in terms of relative humidity) squared as described by Ku [40]. Individual uncertainties involved in the individual measurements were obtained from the investigators' own estimates where these seemed reasonable. Where the investigator did not present a reasonable estimate of uncertainty for a particular parameter, this author made his own estimate of the uncertainty of that parameter based on his judgment of the investigator's work and his estimate of the state of the art at the time of the investigation. The relative humidity uncertainty associated with each of the parameter uncertainties was obtained by calculating the relative humidity with and without the uncertainty added to the related parameter, the difference being the relative humidity uncertainty for that particular parameter.

In some cases the individual parameter uncertainties are not independent in their effect on the relative humidity uncertainty. A case in point is the relative vapor pressure measurement method. In this technique, the individual temperature and pressure measurement uncertainties are of no great consequence, it is the estimates of the temperature difference and the *pressure difference* in the two pressure measurements that are significant. In addition, an estimate of the degree of equilibrium achieved is of significance. In these types of situations, estimates of the differences were used in lieu of estimates of the individual measurements.

In the case of the relative humidity sensor calibration technique, an estimate of the calibration uncertainty as well as temperature uncertainty were used. In the isopiestic technique, the relevant uncertainties are the temperature difference, the concentration determination, the uncertainty in equilibrium and the uncertainty in the reference solution data.

Composite uncertainties for each datum based on the square root of the sum of the individual parameter uncertainties squared were thus obtained.

As stated earlier, these estimates of uncertainties are the result of subjective judgments as well as objective estimates. For the great preponderance of data presented in this paper, these judgments have a minor effect on the relative humidity values as well as the total uncertainty, as was shown by the small difference obtained for the three different methods of weighting.