Surface Measurement Systems
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DVS Application Note 01

Validation of Relative Humidity using Saturated Salt Solutions

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This note describes Validation of Relative Humidity using Dynamic Vapour Sorption (DVS)

Introduction

Validation of humidity generation and measurement in gravimetric vapour sorption instrumentation is an important issue for the pharmaceutical and related industries. This application note sets out a standard DVS method for validation of relative humidity data using saturated salt solutions.

Method

This validation method relies on the principle that the partial vapour pressure of water above a saturated salt solution in equilibrium with its surroundings is a constant at a particular temperature. Table 1 shows data reproduced from the literature [1] for 5 saturated salt solutions with a relative humidity which corresponds to the partial vapour pressure of water vapour above each solution at 298 K (25°C).

Results

The validation method involves making up saturated solutions of the above salts, and measuring the relative humidity above each solution at 25°C using a standard method for a DVS instrument. For each salt solution, the humidity is linearly ramped from above the literature value to below and then back again. At the point where the generated RH is equal to the RH above the saturated salt solution, the rate of change of mass with RH (dm/dRH) of the salt solution is zero.

Table 1. Relative humidities of saturated salt solutions at 298 K.

Salt Solution	Relative Humidity at 298K
LiCl	11.3 %
MgCl2	32.8 %
Mg(NO3)2	52.8 %
NaCl	75.3 %
KCl	84.3 %

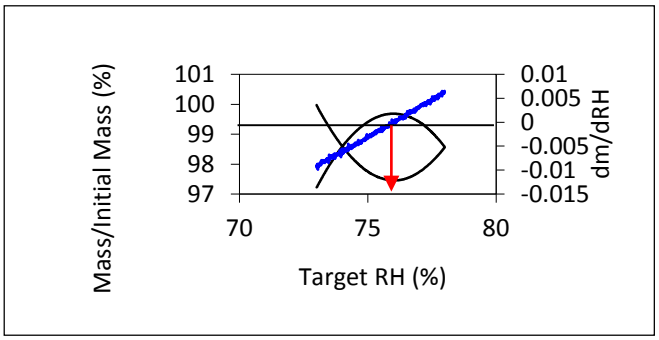

Figure 1. Salt validation experiment for a saturated solution of NaCl at 298 K with a gas flow rate of 200 cc/min.

By plotting the target RH against dm/dRH as shown in Figure 1 and calculating the intercept where dm/dRH = 0, the generated RH can be calibrated against the actual RH above the saturated salt solution at this temperature.

Conclusion

This method provides reliable, accurate and independent validation of RH generation and measurement in DVS water sorption instrumentation.

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References

[1] H. Nyqvist, Int. J. Pharm. Tech. & Prod. Mfr., 4 (2) 47-48, 1983.

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