Dew Point Effects in the Response of Polyaniline to Ammonia-Water Vapour Mixtures

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Increases in polyaniline (PAN) DC resistance are observed of up to 40% $\Delta R/R$ (percentage fractional change in resistance) for 10 ppm ammonia in high humidity nitrogen. For any given relative humidity (RH) value of gas mixture presented, decreasing the sensor temperature increases the sensitivity to ammonia, until a critical temperature is reached below which equilibrium resistance values cannot be obtained. It is found that these “critical temperatures” corresponded closely with the dewpoint temperatures expected for the gas mixture RH - temperature combinations used. The temperature of the sensor itself affects not only the energy of the PAN surface directly but also causes more or less water to form on or within the layer of chemi-resistor, thereby creating a more or less favourable environment for ammonia to partition into. More generally, for sensors possessing hydrophilic layers operating under a range of atmospheric conditions, proper consideration of sensor temperature is essential, particularly if water is involved in the absorption of the target gas.