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Uncertainty Estimation of pH Measurement by ISFET sensor

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We examine the uncertainty of pH measurement by an Ion Sensitive Field-Effect Transistor, or ISFET. Due to its size and ability to simply integrated to measurement electronics, the sensor is suitable for pH measurement on the field. However, the uncontrolled environment can interfere the accuracy of the measurement. In this work we consider a mathematical model of pH measurement that involves the effects of measurement environment, focusing on light and temperature, together with standard uncertainty sources on the sensor. We calculate the average responses of the sensor (Volt/pH unit). In the dark environment, the responses increase slightly with temperatures. We also calculate the temperature coefficient, which can be used to correct the temperature-dependent of the measured pH. With the light, the responses fluctuates and the temperature coefficient cannot be calculated. These results suggest us that the measurement should be perform in the dark. The uncertainty of pH varies with the temperature, and has minimum value about ± 0.03, obtained at 25℃.

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