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CNM pH-ISFET sensor parameters

General

Substrate:	p-type 4-inch silicon wafers
Chip dimensions:	3x3 mm
Gate length:	10 μm
Gate width:	$\geq 500 \mu\text{m}$
Gate structure:	Silicon oxide / Silicon nitride (Standard) (Metal oxide pH-sensitive gate layers are the alternative to silicon nitride)
Devices per chip:	1 ISFET + 1 MOSFET with the same gate geometry 2 ISFETs with the same gate geometry

Position of the ISFET gate on the chip:

A gap between ISFET gate and chip edge and/or metallisation is at least 600 μm wide

Electrical parameters

Operational drain voltage, V_d ,	0.5 - 2.0 V
Operational drain current, I_d ,	0.1 - 1.0 mA
Transconductance, G_m ,	$> 0.5 \text{ mA/V}$
Threshold voltage, V_{th} ,	$-2 < V_{th} < 0.7 \text{ V}$ at pH 7 versus Ag/AgCl reference
Leakage currents, I_l ,	$< 0.1 \text{ nA}$

Chemical parameters

pH sensitivity, S,	50-58 mV / pH (20-25°C)
Linear range,	1 - 13 pH
Precision	0.05 pH
Selectivity coefficients,	$< 10^{-5}$ to alkaline metal ions
Long term drift,	$\leq \pm 0.5$ mV/h (after preconditioning)
Working lifetime	≥ 6 months (mostly depends on the sensor encapsulation procedure and materials)

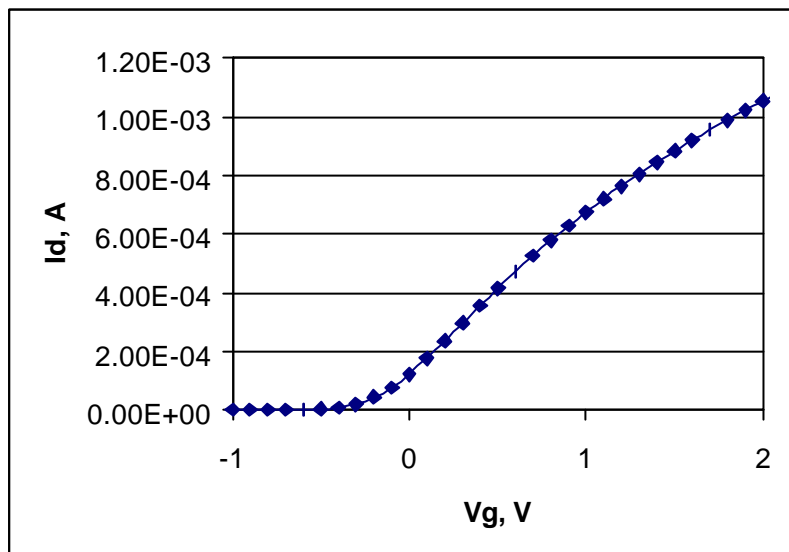


Figure 1. Current-Voltage characteristic of pH-ISFET devices measured at $V_D = 0.5V$

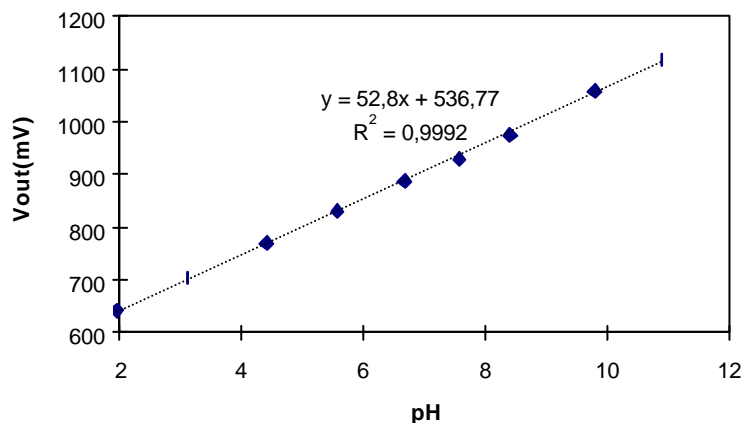


Figure 2 presents a typical Si_3N_4 pH-sensitive ISFET chemical response.

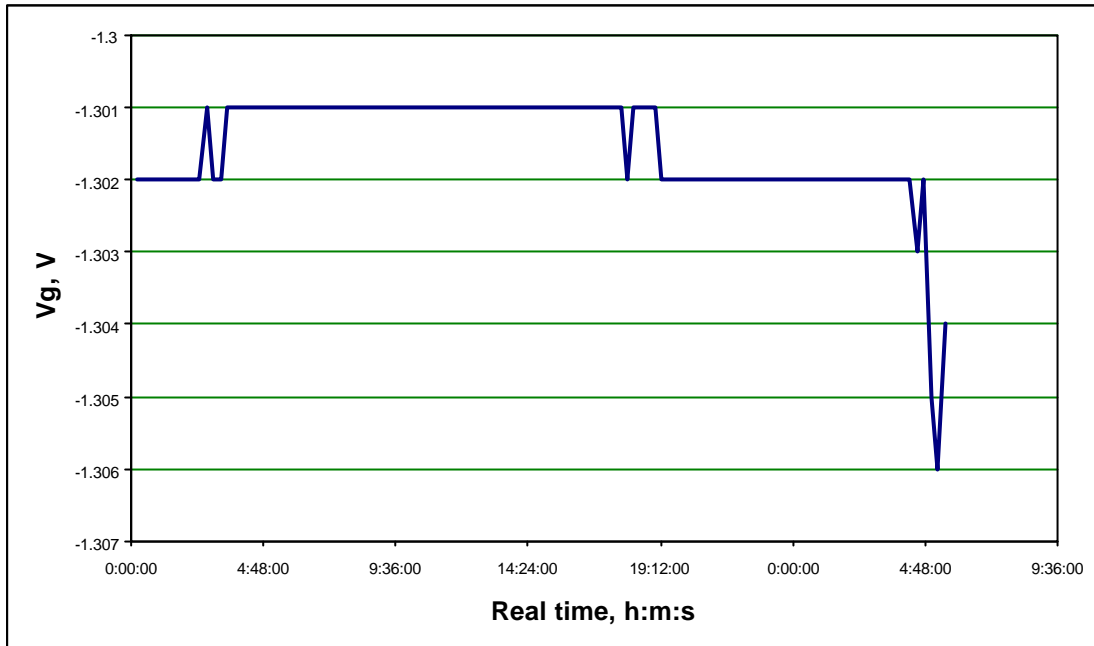


Figure 3. Stability of the ISFET output signal measured at 15 min interval in a solution with pH 7.

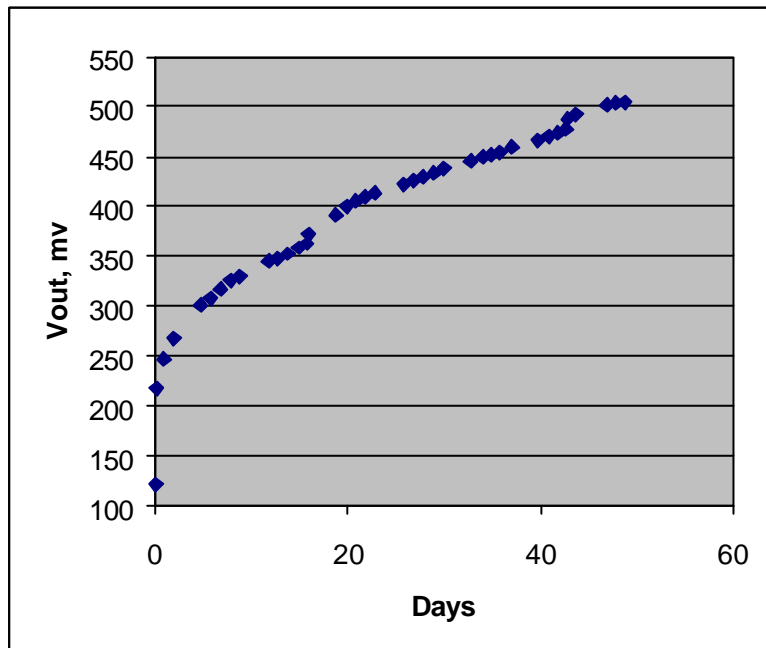


Figure 4. Long-term drift of a silicon nitride ISFET. ISFET is stored in a solution with pH 7 and measurements are taken once per day. The mean drift is $\approx 5\text{mV}$ per day