



Systems of European Water Monitoring SEWING IST-2000-28084



PARTICIPANTS

- Warsaw University of Technology, Poland
- Institut of Electron Technology, Warsaw, Poland
- Technical University of Lodz, Poland
- VTT Helsinki, Finland
- LAAS-CNRS Toulouse, France
- MICROSENS MS, Neuchatel, Switzerland
- Universitat Politecnica de Catalunya, Barcelona, Spain
- Institut fuer Wasserversorge, Gewaesserekoelogie und Abfallwirtschaft, Vienna, Austria
- Systea, Roma, Italy

PROJECT DESCRIPTION

The main objective of the project can be stated as follows:
 Elaborating a cheap and generally accessible system for monitoring and early warning of water pollution. Not only water resources will have the possibility to be monitored continuously, but also all kinds of water in high risk industrial regions should have the possibility of early warning which prevents disastrous pollution. The main emphasis will be done on non-organic ions in agriculture and mining regions, and final complete prototypes of microsystems will concern detecting of hydrogen, ammonium, nitrate, phosphate and chlorine ions. These prototypes will be implemented and evaluated by end-users and prepared for industrial production.

OUR ROLE IN THE PROJECT

Research, manufacturing and realization of ion selective field effect transistors (CHEMFETs) as prototypes of chemical sensors with prescribed ion selectivity.

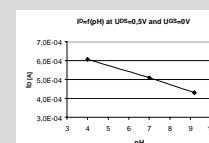
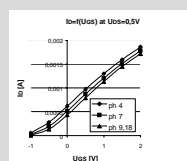
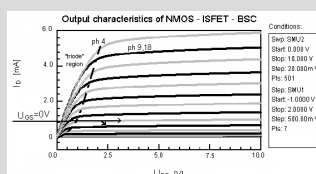
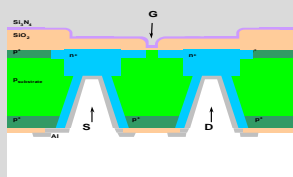
RESULTS

The ISFET (Ion-Selective Field Effect Transistor), as a solid-state sensor based on silicon technology, can be an attractive alternative to the classical potentiometric sensor, exhibiting comparable analytical performances. It can be constructed as a front-side or back-side contact structure. The practical analytical application of the front-side contact FET structures requires their encapsulation, which influences on the long-term stability of the sensors. The design of back-side contact ISFETs eliminates the necessity of the structure encapsulation. Moreover, back-side contact type structures are especially suitable for multiparametric flow analysis and can be applied in water quality monitoring, providing in-situ water analysis without sample preparation.

The measurements performed in this part of the project proved that new back-side contact ISFETs, manufactured by the Institute of Electron Technology, exhibit good performances and enables the accurate determination of pH. Excellent linearity of the pH responses was observed with average sensitivity about 58-60 mV/pH. A sensor drift in order of approximately 3 mV/day was observed, which can results from: drift of the reference electrode potential, drift of the FET amplifier or drift of the silicon FET structure.

The deposition of polyHEMA layer on the gate surface of ISFETs was necessary before further chemical modification of ISFETs, leading to the design of ion-sensitive CHEMFETs. The introduction of such polyHEMA layer, in which an aqueous buffered internal solution was absorbed, eliminated the interference of CO₂ on the CHEMFET response and especially stabilized the potential developed in the sensing membrane. The procedure of the polyHEMA layer deposition was compatible with the IC technology.

BSC N-channel ISFET 6
 main design conception
 - cross section



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