ION-SELECTIVE OPTICAL FIBER

An optical fiber sensor for Ca^{2+} and Na^{+}: affordable and disposable ion-selective optodes

TECHNOLOGY

INO has developed a new sensor technology based on transmission measurements with a specially designed ion-selective multimode plastic optical fiber. The technology allows determination of free ion concentration in aqueous solutions. Ion-selective fiber (ISF) is a multimode plastic optical fiber with a chemically-sensitive cladding. The measuring system is simple and could be used for parallel measurements with several sensors. This technology includes a method of data treatment reducing the need for repetitive sensor calibrations.

APPLICATIONS

ISF technology is aimed at determination and monitoring of free ion concentrations in aqueous samples on a routine basis in:

- Agrifood
- Wastewater treatment
- Clinical labs

COMPETITIVE ADVANTAGES

Major advantages of the INO's ISF technology are:

- Measurement in colored, turbid or opaque media
- Continuous in-line measurement
- No need for recalibration in most situations
- Low cost and easy replacement of the sensing part
- Freeze thaw resistant
- Immune to bubbly media
- Immunity and insensitivity to electromagnetic fields

INTELLECTUAL PROPERTY

Evanescent wave multimode optical waveguide sensor with continuous redistribution of optical power between the modes, **US 7,864,321**

STATE OF DEVELOPMENT

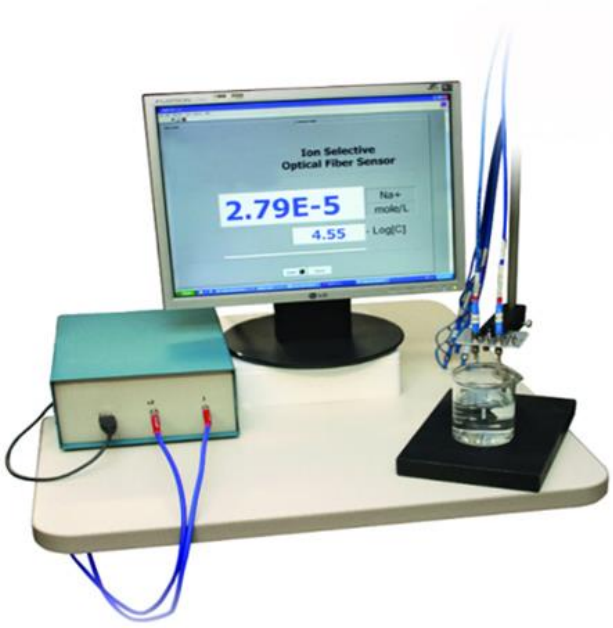
The ISF technology has been developed up to the prototype level. It has been validated for determination of free concentrations in aqueous samples for:

- **Na^{+}**
- **Ca^{2+}**

Currently, pH optode is under development. The technology (sensor configuration and software) is ready for advanced prototyping aimed at final product design. Furthermore, other membranes, based on customers needs, can be developed.

BUSINESS OPPORTUNITY

INO is looking for a manufacturer or an industrial partner having a compatible application to invest in this technology and help bring the ion-selective optical fiber to the level of a commercial device.



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TYPICAL SPECIFICATIONS BY ION at pH 7*

Ion	Na^+	Ca^{2+}
Calibration: concentration range		
log(C_{min}) M	-4	-6.7
log (C_{max}) M	-1.6	-2.1
σ	0.1	0.2
C_{min}, ppm	2.5	0.01
C_{max}, ppm	550	360
Response time	< 3 min	< 1 min
Selectivity, log $K_{I,J}$		
J		
K^+	-2.9	-4.1
NH_4^+	-4.0	-4.1
Na^+	0.0	-4.1
Ca^{2+}	-3.9	0.0
Li^+	-4.0	-3.3
Mg^{2+}	-3.7	-4.6

* pH dependent

- $\frac{C_{(pH)}}{C_{(pH=7)}} = 10^{-(pH-7)}$ for Na^+
- $\frac{C_{(pH)}}{C_{(pH=7)}} = 10^{-2(pH-7)}$ for Ca^{2+}

- Note: pH optode is under development
- Specifications subject to change

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