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FAST BREAKING PAPERS - 2009

August 2009

PDF

Mohammad Reza Ganjali talks with *ScienceWatch.com* and answers a few questions about this month's Fast Breaking Paper in the field of Engineering.

Article Title: Lanthanide recognition: an asymetric erbium microsensor based on a hydrazone derivative
Authors: Faridbod, F;Ganjali, MR;Larijani, B;Norouzi, P;Riahi, S;Mirnaghi, FS
Journal: SENSORS
Volume: 7
Issue: 12
Page: 3119-3135
Year: DEC 2007
* Univ Tehran, Fac Chem, Ctr Excellence Electrochem, Tehran, Iran.
* Univ Tehran, Fac Chem, Ctr Excellence Electrochem, Tehran, Iran.
(addresses have been truncated)

SW: Why do you think your paper is highly cited?

This work is the first report on a PVC membrane microsensor for potentiometric determination of erbium ions in the world. Erbium is one of the lanthanoid members and their selective determination is one of the most challenging areas of research. Finding a suitable ionophore which is able to form a selective complex with one of the lanthanoid cations among the other ones has a significant effect in the construction of ion-selective electrodes (ISE).

Also, since this paper is published in an open access journal (*Sensors, MDPI*), the full text of this new research article is easily accessible to many researchers in the world. Fortunately, I have a curious and diligent research team in my laboratory, where each person is an expert focusing on one of the fields of chemistry—analytical, electro, chemometrics, organic, and inorganic synthesis. In my opinion, good teamwork is the key for development in the new and ever-changing professional scientific world.

Does it describe a new discovery, methodology, or synthesis of knowledge?

This work describes the first asymmetric potentiometric membrane microsensor. The ionophore which is used in this work was synthesized by our team.

Would you summarize the significance of your paper in layman's terms?

The main global problem in the field of ISE was finding a selective sensor for lanthanides. Researchers around the world had tried to construct a selective sensor for lanthanide ions using the aid of ionophores having cavities like crown ethers, but these were not quite successful.

The only way to design an ISE for lanthanide ions is by using ionophores having a

semi-cavity, heteroatoms (mostly S and N as donor atoms), and high flexibility. Such an ionophore can easily form a template with reference to the size of the cation.

Furthermore, this particular ionophore is able to form a stronger complex with one of the cations than with the other ones. This phenomenon can be attributed to the type, number, and site of its donor atoms, its flexibility as well as the size and charge density of the cation.

How did you become involved in this research, and were there any problems along the way?

I have worked on potentiometric sensors for 14 years and I'm the corresponding author of this research article. My research is mainly focused on lanthanide sensors. Up to now, nearly 70% of the lanthanoid sensors in the world have been reported by our research team.

Where do you see your research leading in the future?

The interest in lanthanoid interaction with biochemical molecules arises because they have shown some therapeutic properties during the past decade which can also be used as probes to study the interactions between calcium ions (Ca2+) with biologically important molecules.

Thus, because of the increasing industrial use of lanthanum compounds, along with their enhanced discharge and simultaneously useful and harmful biological activity, monitoring of trace amounts of lanthanoid has recently been of increasing concern. There are several main methods for trace-amount monitoring of lanthanoid ions in solutions. These include X-ray fluorescence spectrometry, inductively coupled plasma-atomic emission spectrometry (ICP-AES), isotope dilution mass spectrometry (IDMS), and neutron activation analysis.

"...because of the increasing industrial use of lanthanum compounds, along with their enhanced discharge and simultaneously useful and harmful biological activity, monitoring of trace amounts of lanthanoid has recently been of increasing concern."

These methods are either time consuming, involving multiple sample manipulations, or simply too expensive for most analytical laboratories. Potentiometric electrodes offer several advantages, such as their quickness and ease of preparations and procedures, simple instrumentation, relatively fast responses, very low detection limits, wide dynamic ranges, reasonable selectivity, portability, and low cost.

This has led to an increase in the number of available sensors and microsensors over the past few years. In addition, the miniaturization of the working electrode for the *in vivo* or *in vitro* determinations of the analyte, or for use in the flow injection system has recently become another interesting area of research.

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KEYWORDS: ER(III); HYDRAZONE DERIVATIVE; MICROELECTRODE; POTENTIOMETRY; SENSOR.

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