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Advanced Materials Science Research

AgNP-DT8 Sensor for the Detection of Inorganic Arsenic (III) by Surface-Enhanced Raman Spectroscopy

Mercedes Iriarte Cela

Star Defense Logistics and Engineering, Spain

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Statement of the Problem: Arsenic, As (III) and (V), in water is one of the most toxic agents for environment ecosystems and human health hazards. From those two species, As (III) has more toxicity in humans than As (V). Specially affected zones are India and Bangladesh where arsenic concentrations are 50µg/L while de World Health Organization (WHO) sets an acceptable concentration limit in drinking water of no more than 10µg/L. Different physical chemistry techniques are commonly used to detect arsenic in drinking water like liquid chromatography inductively coupled plasma mass spectroscopy, atomic absorption or emission spectroscopy that need laboratory analysis. The in situ application of portable Surface Enhance Raman Scattering (SERS) has been previously studied with good results, especially for the detection of As (V). Using the appropriate nano-particle sensor it can be achieved concentrate detection up to 10-9 mol/L, aprox. 0.075µg/L. Nevertheless the most poisoning arsenic, As (III), suffers an easily oxidation to As (V) due to the radiation exposition during the SERS analysis. This effect has not been solved yet and, thus, it's not possible to know the real As (III) concentration in drinking water. We proposed a silver nano-particle sensor, AgNP, specially functionalized with 1,8-Octanedithiol (DT8) for a sensitive and selective detection of As (III) in drinking water. The affinity of As for the thiol (-SH) chemical groups is already known in Dimercaprol, an antidote for arsenic poisoned systems. At the same time, DT8 has been used before as a linked molecule from AgNP to some molecules which are not attracted on metal surface. Over this hypothesis, we are developing an arsenic (III) detector where the ion can be captured by adjacent thiol groups from the DT8 molecules linked on AgNP in order to capture the As (III) in between gaps, avoiding ion oxidation, Fig 1.

Publications

- Characterization of the telomeric transcriptome from Chironomus sp. Sequence analyses and structural prediction
- Micro-Raman spectroscopy of rock paintings from the Galb Budarga and Tuama Budarga rock shelters, Western Sahara
- µ-Raman spectroscopy of prehistoric paintings from the El Reno cave (Valdesotos, Guadalajara, Spain)
- Micro-spectroscopy of rock art paintings from the Cueva Mayor of the Atapuerca site (Burgos, Spain)
- Raman microscopy of hand stencils rock art from the Yabrai Mountain, Inner Mongolia Autonomous Region, China

Biography

Mercedes Iriarte Cela has her expertise in physical chemistry, with special attention in vibrational spectroscopy and chemical nanotechnology. In these past years she has been especially dedicated in synthesizing different metal nano-particles for the development of sensors for Surface Enhanced Raman Scattering (SERS). She has developed sensitive and selective sensors for the detection of persistent organic pollutants (POPs) like paraquat, diquat, DDT or aldrin. One of he aims of her research is the improvement of environmentally friendly chemical methods as well as healthcare interests. She is currently working on the development of new nano-sensors multiplexing, as well as essays on the applications of nano-particles for the creation of new generational materials. Simultaneously, she has been teaching as a tutor in the Distance National Spanish University (UNED) in Physical Chemistry disciplines.

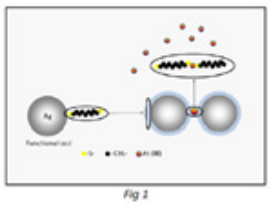

Fig 1

Citation: Mercedes Iriarte Cela, AgNP-DT8 Sensor for the Detection of Inorganic Arsenic (III) by Surface-Enhanced Raman Spectroscopy, Smart materials 2020, 7th International Conference on Smart Materials and Nanotechnology, Prague, Czech Republic, 20-21 July,2020,18