

Surface-Enhanced Raman Scattering for arsenic detection and discrimination

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Arsenic (As) is one of the most toxic contaminants found in the environment and especially in water. The World Health Organization decrees an As concentration less than 10 µg/L (10ppb). Established laboratory method is mass spectrometry. This technique is costly and time-intensive [1]. Other methods for As detection in water are in state of research (biosensor, electrochemical sensor, Surface Enhanced Raman Scattering sensor) (Figure1)

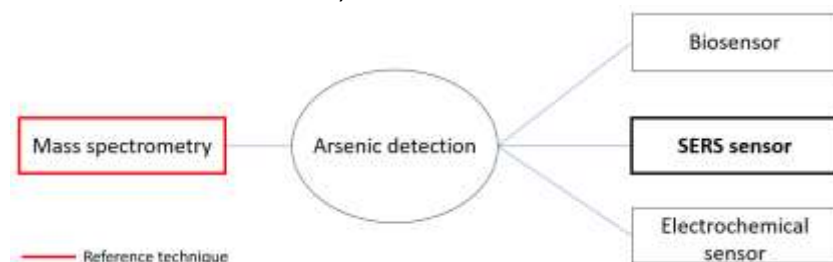


Fig 1: Summary of arsenic detection

SERS sensors are known for their high sensitivity for chemical compounds detection like pesticides [2]. In this study, we compare two kinds of silver (Ag) SERS substrates differentiating by their elaboration process. Figure 2 shows SERS results of As detection at a concentration of 10 ppb obtained with substrates made by an electroless process. Bands at 730 cm⁻¹ and 830 cm⁻¹ are the signature of the symmetric stretching vibrations As–O for As(3) and As(5) respectively [3] [4]. Uptake of As in water by nanostructured Ag films is discussed.

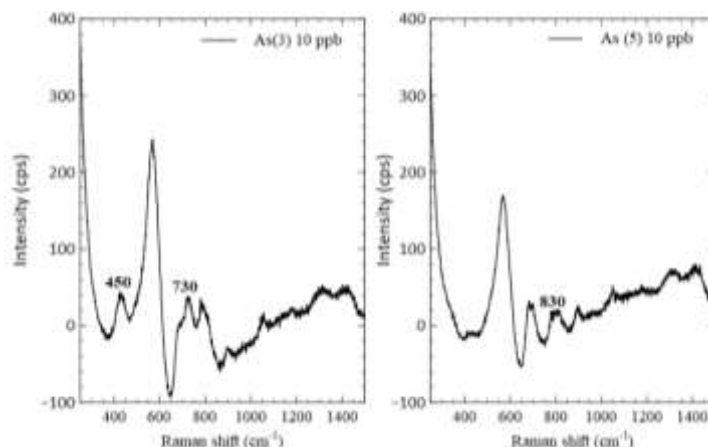


Fig 2: SERS spectra of As(3) and As(5) on SERS substrates made by an electroless process

References:

- [1] M. Singh and M. del Valle, *Arsenic Biosensors: Challenges and Opportunities for High-Throughput Detection*, Handbook of Arsenic Toxicology, 575-588 (2015)
- [2] J. Hao, M.-J. Han, S. Han, X. Meng, T.-L. Su and Q. K. Wang, *SERS detection of arsenic in water: A review*, Journal of Environmental Sciences, **36**, 152-162 (2015)
- [3] Z. Xu, J. Hao, F. Li et X. Meng, *Surface-enhanced Raman spectroscopy of arsenate and arsenite using Ag nanofilm prepared by modified mirror reaction*, Journal of Colloid and Interface Science, **347**, 90-95 (2010)

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