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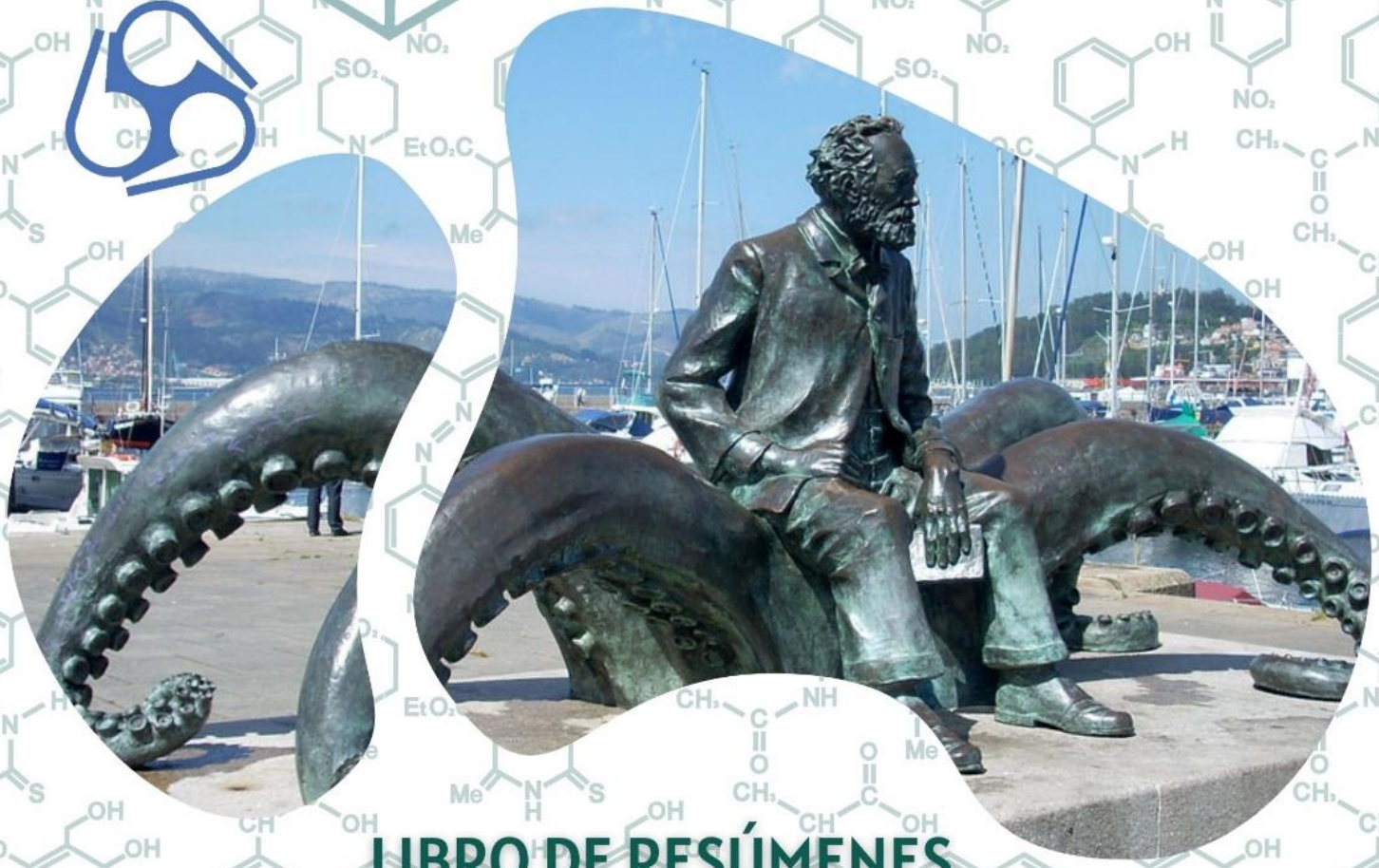

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SMART SAMPLING PROCEDURE FOR METAL IONS ASSESSMENT IN DYNAMIC WATER SYSTEMS

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Water bodies are dynamic systems, and the presence of metal ions must be a target of spatial-temporal monitoring. The adverse effects of metal ions are well documented, not only for those which display toxic, carcinogenic, mutagenic and teratogenic effects for living organisms like lead, cadmium, mercury, arsenic and chromium but also for zinc, iron and copper, if present in high concentrations. In aquatic systems, they can be present in different forms, namely by the chelation of their metal ions with inorganic or organic ligands, making their toxicity dependent on the respective form. The real-time monitoring is rather cumbersome as current methods rely on transport to off-site laboratories, disrupting the sample characteristics due to pH and redox potential change and exposure to oxygen, light or temperature shifts, leading to diverse chemical equilibria shifts. In this context, a project, denominated Aqua_Smart, was designed with the main aim of devising an integrated smart sampling and automatic monitoring of toxic metal ions in aquatic systems.

The idea is to devise microtubes (cartridges-like tubes) packed with novel sorbents (SPE) to collect the samples. These can be moved to specific sampling points and used in onboard campaigns. The sorbent material can be enriched with analytes by perfusing the sampling device with a large water volume, along with interferents removal; then, the enriched plug is eluted for measurement. The analytical determination is to be based on flow-based techniques with miniaturized optical detection to make the apparatus portable equipment. The whole process, sampling/preparation/measurement, will become automated, enabling the real-time monitoring of various metal species in water bodies. Within the scope of this project, a cartridge packed with a sorbent material for cadmium sampling and enrichment was developed. Additionally, a sequential injection method, using cartridges to discriminate between the different analytes, was also developed for the multiparametric determination of copper, zinc, and manganese determination in water.

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