PÔSTER - RESUMO - SENSORES E BIOSSENSORES

AMAZONIAN BIODIVERSITY MATERIALS APPLIED IN AN ELECTRONIC TONGUE FOR POLLUTANT DETECTION USING ARTIFICIAL INTELLIGENCE TECHNIQUES

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The integration of low-cost analytical research with artificial intelligence techniques has been continuously advancing in the search for new methods to monitor pollutants harmful to the environment and human populations, since the presence of pollutants in Amazonian rivers, especially heavy metals, is associated with high incidence rates of diseases and mortality. In this context, one strategy to achieve such an ambitious goal is the development of sensitive, selective, and low-cost analytical devices capable of identifying heavy metals in riverine environments. This has led to the development of a methodology based on the efficient analysis provided by sensors composed of an electronic tongue, which enable rapid detection within a short time frame. Analyses of this nature can be implemented to protect millions of riverine inhabitants and prevent the spread of diseases, since pollutants can be detected even before adverse effects arise, thereby improving both public health and environmental conditions. This scenario has motivated research into sensors constructed from nanomaterials, which enable test miniaturization, low production cost, and rapid results. This work aims to develop an electronic tongue to detect pollutants in rivers of the Amazon region using sensory units composed of nanostructured films and recyclable materials derived from the Amazon. These films consist of polyaniline (PANI), poly(o-ethoxyaniline) (POEA), and polypyrrole (PPy), synthesized using copaiba oil, banana cellulose, and tucumã oil deposited onto electrodes. The following metals were detected: mercury (Hg), lithium (Li), aluminum (Al), cadmium (Cd), copper (Cu), manganese (Mn), nickel (Ni), and lead (Pb); however, mercury is the primary element responsible for ecological disasters and severe impacts on human health. The sensor surfaces were characterized by electrical impedance spectroscopy, and detection was performed using the same technique with commercial samples. In addition to detection, sensor selectivity analyses were conducted using information visualization maps and statistical analyses through the PEx-Sensors software, along with interpretability techniques represented by ExMatrix applied to decision tree (DT) models, enabling optimization of the sensory unit conditions and parameters. The combination of characterization, detection and artificial intelligence techniques made it possible to identify device properties and optimize their performance in terms of sensitivity and selectivity for the intended application. Thus, excellent performance was achieved for metal detection, with rapid analysis time, which is essential for environmental protection.

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Palavras-chave: electronic tongue; heavy metals; pollutants; electrical impedance.