

PÔSTER - RESUMO - DISPOSITIVOS ELETRÔNICOS, ELETROQUÍMICOS,
SUPERCAPACITORES E BATERIAS

**CONTAMINATION OF GOLD ELECTRODES BY SALINE SOLUTIONS:
EVALUATION OF CLEANING METHODS BY ELECTROCHEMICAL
IMPEDANCE SPECTROSCOPY**

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The LabSiN group of the Physics Department at UFSC has developed a differential impedimetric analysis (GPE analysis) that extracts capacitance and resistance values without frequency dispersion and without the need to interpret the data using pre-conceived models [1]. The GPE method opens up a range of opportunities in the areas of health and environmental monitoring, as it enables the rapid interpretation of data obtained by impedimetric and conductimetric sensors. In this context, the use of gold in the manufacture of the sensor element is widespread due to its inert nature and ease of functionalization. However, we have found that interdigitated gold electrodes occasionally exhibit anomalous impedimetric behavior, which could be associated with the existence of a thin semiconductor film on the gold tracks. The formation of this film generally occurs after immersion of the electrode in saline solutions. However, some virgin electrodes also exhibit the same anomalous behavior. In this work, we sought to evaluate different cleaning methods (chemical, electrochemical, and mechanical) through the impedimetric characterization of a cylindrical gold electrode. Its cylindrical geometry minimizes edge effects, which ensures a

narrow distribution of relaxation times. The solid nature of the electrode allows various cleaning methods to be tested, including heat treatment and mechanical polishing. The results show that exposing the electrode to chlorine-based saline electrolytes leads to an increase in the relaxation time distribution and a drastic drop in the double-layer capacitance. Chemical and electrochemical cleaning procedures did not produce the expected results [2]. Recovery of the metallic state of the surface was only achieved after mechanical polishing of the electrode using alumina solutions.

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References:

[1] M.L. Sartorelli et al., *Electrochim. Acta* 390 (2021) 138796

[2] L. M. Fischer et al., *Microelectronic Eng.* 86 (2009) 1282

Palavras-chave: electrochemical impedance spectroscopy; generalized phase element; interdigitated electrodes; conductivity cell.