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Micorelectrochemical sensing and deposition within bubble film

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We describe a novel electrochemical cell design with a thickness of about 30 µm that comprises a carbon fiber electrode (10 µm diameter) placed through a bubble wall (or stable surfactant film) which serves as the solution. To create a durable surfactant film, we employed a solution infused with non-ionic Triton-X100 surfactants. To do electroanalysis, a modified carbon microelectrode with nanosheet graphene oxide (as a sensing electrode) was placed through a soap bubble wall along with a 1 mm diameter silver wire as the counter/reference electrode [1].

By using this strategy, the proposed sensing system has demonstrated successful detection of NO_2- both on the hand and dissolved in Triton-X100 surfactants film[2-3]. This technique holds particular significance in criminal investigations, as the presence of NO2- ions on the hand is indicative of gunshot residue and can aid in identifying suspects. Therefore, this method is a rapid analysis with a low limit of detection of 28 µM and proves functinality for on-site sensing.

To do electrodeposition in a bubble wall, different ions such as silver and palladium ions were dissolved within the bubble film, a bare carbon microelectrode is placed inside the bubble wall , and the suitable cathodic potential is applied. The deposited metallic film was analyzed by scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy. The images obtained from the analysis revealed that the thickness of the bubble wall or electrochemical cell imposes limitations on the electrodeposition area at the microscale level. Furthermore, the lifespan of the bubble wall [3] played a crucial role in controlling the duration and thickness of the deposited film from nanoscle to microscle.

Keywords: Microelectrochmeistry, Microdepostion, Thin film, Nitrite detection, Bubble film.

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