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Microdisc versus microcylinder electrodes: Detection of solution phase trace oxygen

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The specific apparent capacitance (Farads per unit geometric area) of commercial carbon microdisc electrodes and in-house fabricated carbon micro-cylinders is studied through the use of cyclic voltammetry. For accurate electroanalytical measurements, three important considerations need to be taken into account. A reduced geometric area does not necessarily lead to practically low capacitances due to factors such as surface roughness, poor sealing and potential micro-fractures leading to a significant variation in experimentally observed capacitance. Comparing the specific apparent capacitances of working electrodes, the capacitance of fabricated carbon microcylinder electrode was found to be lower by a factor of 35 despite the fact that both type of electrodes were made of nominally the same material. As a consequence of the reduced capacitance, carbon microcylinder electrodes were experimentally proven to be superior in terms of analytical sensitivity over commercial carbon microdisc electrodes. We further demonstrate practically how the electroanalytical limit of the detection of solution phase trace oxygen is significantly improved using such microcylinder electrodes. Finally we show that after the degassing of a solution by nitrogen purging even in the most commonly encountered 'best' case scenarios approximately 10 mM of oxygen remain present in the electrochemical cell, unobservable by the commercial microdisc electrodes, but detectable with microcylinder electrodes, testifying to their analytical superiority.

Biography

Kristína Cinková has graduated in Analytical Chemistry in 2014 and is a PhD student at the Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Slovakia. She is interested in characterization and utilization of novel electrode materials in determination of biologically active compounds in various matrices. Her contribution to carbon microdisc electrodes was done within the scholarship program at the University of Oxford. She is the author and co-author of 14 papers published in reputed journals.

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