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Abstract

Two-Dimensional Carbon Nanomaterials for Electrochemical and Plasmonic Sensing Applications †

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Two-dimensional carbon nanomaterials are very popular in chemo- and biosensor development. The high surface area and the outstanding electrochemical and electronical properties make them attractive candidates as sensing material. To date, it is still challenging to prepare well-defined, defect-free 2D-nanomaterials in a reproducible way. Here, chemical and mechanical methods for the fabrication of colloidal stable graphene dispersions with focus on the flake-size distribution, the number of defects and the physicochemical properties are discussed. A method is proposed to transfer the graphene materials on electrodes and nanostructured gold surfaces for sensor development. As one example for a feasibility study, amperometric sensors were constructed with various types of graphene using glucose as the model analyte. Selectivity was introduced by electrochemical deposition of Nickel nanoparticles on top of the 2D-nanomaterial. For plasmonic sensing, graphene is shown to enhance surface plasmon resonance sensitivity, especially for small molecules such as plastisizers or purine-based biomarkers when combining nanostructured gold substrates with 2D-nanomaterials.