Development of novel routes for surface functionalisation with diazonium derivatives and their application in electrochemical genosensing.

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Electrochemical biosensors are attractive tools in clinical and environmental analysis, allowing fast and reliable acquisition of physiological and genetical information.

The stable and reliable immobilisation of biomolecules onto surfaces is a key step in the development of biosensors being the sensitivity; selectivity, stability and reproducibility of the sensor strongly affected by this.

The aim of the work presented herein is to develop novel approaches for the functionalisation of conductive surfaces (Au, carbon and Pt) via the use of a newly designed catalytic approach based that take advantages of the reducing ability of metals, in this case Cu and Zn, powders. In order to prove the effectiveness of the proposed method an in-house synthetised dipodal diazonium compound, containing a carboxylic group, was immobilised onto the surface of Au and GC electrodes using the proposed method. Several parameters such as the diazonium salt concentration and immobilisation time were optimised in the case of Au and carbon surfaces. The proposed method was demonstrated to promote rapid (below 10 minutes), efficient and stable functionalisation of different surfaces with the advantage of not requiring application of potential making it much more versatile. In addition, to electrochemical characterisation FTIR, AFM and XPS studies of the surfaces obtained on carbon and gold substrate was achieved.

Finally to demonstrate the potentiality of the prepared surfaces in biosensor application a genosensor for the detection of *Francisella tularensis* was developed. The general strategy involved the linking of the capture probe to the grafted diazonium salt modified with a carboxylic group via streptavidin – biotin interaction. This probe was then used to hybridise the DNA target in a 'sandwich'-type format; secondary DNA probe labeled with HRP was used to transduce the recognition event via amperometry.