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Nanotechnologies — Nano-object- assembled layers for electrochemical bio-sensing applications — Specification of characteristics and measurement methods

*Nanotechnologies — Couches nanostructurées pour des applications
de biodétection électrochimique — Spécification des caractéristiques
et des méthodes de mesure*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*.

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Introduction

Electrochemical electrodes can exhibit nano-enhanced performance after the deposition of nano-objects on the electrode surface. The increased surface area, orientation, the assembled density and ability to control the bio-receptor of the nano-object layer improves the performance of nano-biosensors. Nano-biosensor sensitivity, selectivity and reliability can be enhanced with specific nano-objects, e.g. gold nanoparticles^{[22][25][26]}, carbon nanotubes^[24], CuS₂ nanorods^[37] and silver^[38] or palladium nanoplates^[23].

Currently, most of the nano-enhanced electrochemical electrodes are fabricated by researchers in order to achieve predictable performance in their own programs without mass-production. However, the technology is maturing into a commercial phase. Fabricators are offering nano-enhanced electrodes to instrument manufacturers as a platform to add additional coatings for specific sensing applications. This document supports the development of material specifications for the transaction between electrode fabrications and instrument manufacturers to allow the purchase of electrodes with predictable performance.

This document is intended to help address this issue. It is also relevant to the process of qualification, specification and use of nano-object-modified electrodes. The standardization of protocols to specify various types of nano-object-modified electrodes related to electrochemical detection will be used by most manufacturers or business owners of electrochemical electrodes products. This document focuses on the nano-object-assembled layer on electrodes by means of a solution process for electrochemical applications.

In this document, the specifications for a nano-object constituting an assembled layer are provided, based on ISO/TS 12805, which describes the characteristics of manufactured nano-objects and their measurement methods (see [Annex A](#)). In addition, the characteristics of nano-object-assembled layer for enhanced electrochemical bio-sensing applications and their measurement methods are provided in detail.