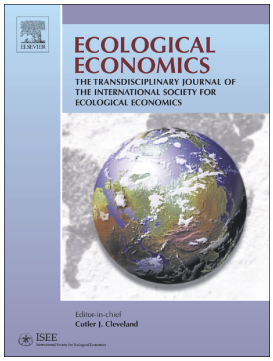

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PII: S1388-2481(17)30041-3
DOI: doi: 10.1016/j.elecom.2017.02.009
Reference: ELECOM 5881

To appear in: *Electrochemistry Communications*

Received date: 13 December 2016
Revised date: 3 February 2017
Accepted date: 8 February 2017

Please cite this article as: Yang Liu, Benjamin J.J. Austen, Thomas Cornwell, Rhys D. Tilbury, Mark A. Buntine, Anthony P. O'Mullane, Damien W.M. Arrigan , Collisional electrochemistry of laser-ablated gold nanoparticles by electrocatalytic oxidation of glucose. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Elecom(2016), doi: 10.1016/j.elecom.2017.02.009

Collisional electrochemistry of laser-ablated gold nanoparticles by electrocatalytic oxidation of glucose

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Abstract

We report the electrochemistry of gold nanoparticles (AuNPs), prepared by Laser Ablation Synthesis in Solution (LASiS), via the electrocatalytic oxidation of glucose upon single nanoparticle collisions at inert microelectrodes. Spherical AuNPs with diameters in the range 20–30 nm, as determined by transmission electron microscopy, were synthesized by LASiS of a gold plate immersed in water. Nanoparticle collisions were electrochemically detected through the AuNP-catalysed oxidation of glucose at carbon fiber microelectrodes in alkaline solution, enabling the electrocatalytic detection of single AuNPs. This approach provides a basis for detecting and understanding the electrocatalytic properties of pristine nanoparticles in aqueous solutions.

Keywords: gold nanoparticles; laser ablation; glucose; electrocatalysis; nano-impact

1. Introduction

The diverse exploration of nanoparticles has resulted in a significant increase in nanoparticle-based products, ranging from home disinfectants to industrial catalysts [1]. With the concomitant potential for increased release of nanoparticles into the environment, posing potential risks to human health, it is highly desirable to develop effective analytical tools for the detection and characterization of single nanoparticles, particularly in complex aqueous systems [2]. In recent years, the innovative nano-impact electrochemical method, which is used to study *in situ* the behaviors of single nanoparticles in a liquid phase by virtue of their random collisions with electrode surfaces, has attracted considerable interest [3-5]. This method enables new insight into the physical and chemical properties of solution-phase nanoparticles,