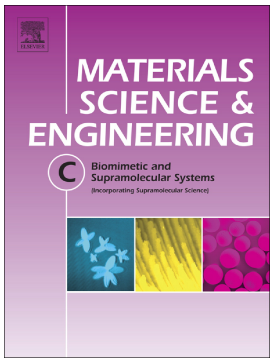


# Gold-capped silicon for ultrasensitive SERS-biosensing: Towards human biofluids analysis

Agnieszka Kamińska, Tomasz Szymborski, Tomasz Jaroch, Adam Zmysłowski, Arkadiusz Szterk

PII: S0928-4931(17)32005-2
DOI: doi:10.1016/j.msec.2017.11.029
Reference: MSC 8328

To appear in: *Materials Science & Engineering C*

Received date: 8 June 2017
Revised date: 23 August 2017
Accepted date: 22 November 2017

Please cite this article as: Agnieszka Kamińska, Tomasz Szymborski, Tomasz Jaroch, Adam Zmysłowski, Arkadiusz Szterk , Gold-capped silicon for ultrasensitive SERS-biosensing: Towards human biofluids analysis. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Msc(2017), doi:10.1016/j.msec.2017.11.029

# Gold-capped silicon for ultrasensitive SERS-biosensing: towards human biofluids analysis

Agnieszka Kamińska[a*], Tomasz Szymborski[a], Tomasz Jaroch[a], Adam Zmysłowski[b] and Arkadiusz Szterk[b]

[a] Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland

[b] National Medicines Institute, Chełmska 30/34, 00-725 Warsaw, Poland



## Abstract

Surface-enhanced Raman spectroscopy (SERS) has been widely used in a variety of biomedical, analytical, forensic and environmental investigations due to its chemical specificity, label-free nature combined with high sensitivity. Here, we report a simple, two steps method for the fabrication of reproducible and reliable, well-defined, stable SERS substrates with uniform and giant Raman cross-section of 'hot spots' suitable for routine trace chemical analysis and detection of biological compounds in complex biological fluids. We prepared porous silicone (PS) surface by a galvanostatic anodic etch of crystalline silicon wafers. The electrochemical process generates a specific layer of PS: the thickness and porosity of a given layer is controlled by the current density, the duration of the etch cycle, and the composition of the etchant solution. These substrates presented high sensitivity to *p*-mercaptobenzoic acid (*p*-MBA) at a low concentration of $10^{-6}$ M and the enhancement factor of over $10^{8}$ was achieved. Such high enhancement is attributed to semiconducting silicon-induced and stabilized hot spots. The uniform density of SERS–active 'hot-spots' on the Au/Si surface results in high