K Nagata et al., J Biosens Bioelectron 2017, 8:2(Suppl)
DOI: 10.4172/2155-6210-C1-034

7th Euro Biosensors and Bioelectronics Conference

July 10-11, 2017 Berlin, Germany

Butterfly wing scales as a model template for SERS applications

K Nagata[1], R Hirano[1], H Takei[1], T Okamoto[2], N Frese[3], H Vieker[3], A Beyer[3] and **A Gölzhäuser[3]**
[1]Toyo University, Japan
[2]RIKEN, Japan
[3]Bielefeld University, Germany

We will discuss exploitation of naturally-existing nanostructures for bio-analytical techniques, specifically surface-enhanced Raman spectroscopy (SERS). Raman spectroscopy is one of the few analytical techniques capable of giving information on chemical structures without need to place the sample in a vacuum, making it well suited for on-site inspection of chemical species as in environmental monitoring, forensic sciences and quality control. There are already a number of commercial vendors selling SERS substrates, but the price needs to be reduced significantly in order to make this technique widely used. Our group has been investigating: Random-MFON structures whereby randomly adsorbed SiO_2 nanospheres are coated with a noble metal and; silver dendrites grown from surface-adsorbed base metal nanoparticles in a $AgNO_3$ solution. Here, we report on yet another method based on exploitation of scales of butterfly wings. We found that coating of butterfly wing scales, characterized by intrinsic nanostructures, with silver gives rise to a surface capable of showing SERS effects. While effectiveness depends on the butterfly species, precise scales within a single wing, the amount of deposited silver etc., there is a surprising uniformity in SERS signal intensities when these parameters are selected appropriately. By exploiting naturally-existing nanostructures, we can minimize the number of manufacturing steps, thus, reducing the overall cost. We can also obtain basic information on secret as to what makes a particular nanostructure work by selectively altering the underlying nanostrucures. This would give us an option of artificially recreating the crucial nanostructures.

Biography

K Nagata obtained his BA in March 2017 from the Faculty of Life Sciences of Toyo University. Starting with Agriculture, his interest evolved to Entomology where he encountered the cross-disciplinary area of Biomimetics. Specifically, the possibility of using natural nanostructures found in butterfly wing scales as a basic technological platform for a new analytical technique intrigued him. As part of his graduation thesis, he carried out a detailed study on correlation between morphology of silver-coated scales and their effectiveness for surface-enhanced Raman spectroscopy. He has made his first presentation at the 76th Annual Conference of the Japan Society of Analytical Chemistry at Gifu in 2017, followed by a presentation at Pittcon 2017 in Chicago, USA. Now he is enrolled in the Master's program at the Graduate School of Life Sciences at Toyo University under the supervision of Prof. H Takei. While the main emphasis is exploitation of silver-coated scales for practical SERS applications, he is also interested in obtaining a basic understanding how different areas of the nanostructures contribute to SERS effects. Different scales are characterized by different SERS performance, and even within a single area, dorsal and ventral scales, external and internal, need to be characterized separately.

s39101700135@toyo.jp

Notes: