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Three types of nanostructure platforms for plasmonics detection of target molecules on a solid surface or in a complex medium

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Plasmonics is expected to play a growing role in biosensing and environmental monitoring. It is in the area of localized surface plasmon resonance sensing and surface-enhanced Raman/fluorescence spectroscopies where there is much expectation. It is crucial to develop techniques for producing requisite nanostructures reproducibly at low costs. Toward this end, we are working on a number of different techniques. One is based on metal film on nano-spheres (MFON) where randomly-adsorbed SiO₂ nano-spheres are used as a template. The second method is a chemical method whereby base metal nanoparticles are used as seed for growing silver nano-structures from AgNO₃. The third method is based on exploitation of naturally existing nanostructures such as butterfly wing scales; scales coated with Ag have been shown to be an effective SERS platform. We will discuss pros and cons of these three fabrication techniques. Furthermore, the method of detection protocols is important. We have been working on different configurations. One is intended for *in-situ* detection of target molecules on a solid surface, such as residual pesticides on agricultural produces as well as identification of chemical evidence at a criminal scene. With this in mind, we have prepared a flexible surface coated with noble metal nanostructures, calling it FlexiSERS. Placing FlexiSERS onto a surface allows *in situ* SERS identification of the chemical species on the surface. We have also combined a SERS surface with thin layer chromatography, TLC-SERS. This has allowed detecting Raman-active species in the complex medium such as food.

Biography

Hiroyuki Takei completed his PhD in Applied and Engineering Physics at Cornell University in 1992. Since then, he has been affiliated with various organizations such as Hitachi Ltd. (Electronics), Lamdagen LLC (Biosensor start-up in silicon valley), Fujirebio Inc. (Medical Diagnostics), and Tokyo Medical and Dental University. Since 2009, he has been Full Professor in Department of Life Sciences at Toyo University, Japan. His main research interest has been in the field of "Biosensing and analytical techniques based on plasmonics".

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