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Active gap SERS with plasmonic nanostructures on hydrogels for the sensitive detection of biomacromolecules

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Surface-enhanced Raman scattering (SERS) is a promising approach for the label-free detection of molecules. The morphology of metal nanostructures is a primary factor determining the magnitude of signal enhancement on Raman scattering. In general, a narrower gap can form a stronger electromagnetic field, but it makes insertion of analytes into a hot spot more difficult. This is a trade-off when using conventional SERS substrates. We have fabricated tunable plasmonic nanostructures, the gap distances of which can be controlled by the salt concentration, through the formation of gold nanoparticle self-assembled thin films on solid substrates and their transfer onto poly-acrylic acid gel. The extinction spectra shifted reversibly with volume change of the gel according to the degree of swelling. When the target molecules were injected onto this substrate as the gaps were opened (widened) and SERS was measured after the gaps were closed (narrowed), the signals became stronger than that observed without any gap control. This method can be served for the sensing of macromolecules such as proteins.

Biography

Kuniharu Ijiro received his Doctor of Engineering degree from Tokyo Institute of Technology, Japan in 1991. He worked as an Alexander von Humboldt Foundation Research Fellow at Ringsdorf's group in Johannes Gutenberg University Mainz, Germany. He is working as the Professor and concurrently the Deputy Director of the Research Institute for Electronic Science (RIES) and the Professor of the Global Institution for Collaborative Research and Education (GI-CoRE), Hokkaido University. He is interested in biomimetic self-assembly of nanomaterials and polymers to create novel functions.

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