Simultaneous Detection of Multiple Biomarkers Using SERS-Based Immunoanalysis

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We report a highly sensitive surface-enhanced Raman scattering (SERS)-based immunoassay platform for the simultaneous detection of multiple biomarkers. Metal nanoparticle is emerging as one of the most effective optical detection tools in nanobiotechnology. Depending on the chemical composition, their optical properties have garnered much attention in biological studies approaching molecular dimensions. In this presentation, we report a quick and reproducible surface-enhanced Raman scattering (SERS)-based immunoassay technique, using hollow gold nanospheres (HGNs) and magnetic beads. HGNs show strong SERS enhancement effects from individual particles because hot spots can be localized within pinholes in the hollow particle structure. Accordingly, HGNs can be used for highly reproducible immunoanalysis of cancer markers. Magnetic beads were used as supporting substrates for the formation of the immunocomplex. In addition, a SERS-based sandwich immunoassay has been performed in a gradient microfluidic channel. For validation, a well-known lung cancer marker, carcinoembryonic antigen (CEA), was used as a target. Based on experimental results, the limit of detection (LOD) was determined to be 1-10 pg/mL, this value being about 100-1000 times more sensitive than the LOD of conventional ELISA. Furthermore, the assay takes less than one hour to complete, including washing and optical detection steps. Our proposed SERS-based immunoassay technique, with antibody-conjugated HGNs and magnetic beads, has many advantages over previously reported SERS detection methods, such as good reproducibility, low limit of detection and fast assay time. This technique is expected to be a powerful clinical tool for fast and reliable cancer diagnosis. In this presentation, a novel SERS-based microfluidic sensing technique for the fast and sensitive immunoanalysis will be introduced.

References

1. H. Chon, S. Lee, S. Y. Yoon, S. I. Chang, D. W, Lim, J. Choo: Chem. Commun. 47 (2011) 12515.
2. H. Chon, C. Lim, S. M. Ha, Y. Ahn, E. K. Lee, S. I. Chang, G. H. Seong, J. Choo, Anal. Chem. 82 (2010) 3029.

