Surface Self-Precipitation Au Nanoparticles on TiO_2 Nanofibers for Surface-Enhanced Raman Scattering Detection of Environmental Hazards

Chang Gung Univ.[1], Chang Gung Memorial Hospital at Linkou[2],

○Yin-Hsuan Chang[1], Ting-Han Lin[1], Kai-Chi Hsiao[1], Jia-Mao Chang[1], Ming-Chung Wu[1,2]

E-mail: mingchungwu@cgu.edu.tw

In this study, we have developed a simple and effective technique for creating a surface-enhanced Raman scattering (SERS) substrate. This technique is premised on the self-assembly of uniformly dispersed metallic nanoparticles (Au, Ag, Cu, Pt) onto a TiO_2 nanofibers matrix synthesized by a one-pot hydrothermal method. We meticulously fine-tuned various synthesis parameters including the type of metal dopant, precursor concentration, reaction temperature, and duration. The degree of enhancement for organic dyes, such as methyl red, methyl orange, brilliant green, and methylene blue, detection is closely related to both the absorption peak of the organic dye and the excitation wavelength of the Raman system. In fact, we have observed a remarkable 570-fold enhancement in signal intensity using Au-TiO_2 SERS substrate. The advantages of our SERS substrate include its high sensitivity, low cost, and rapid response time, making it highly suitable for the design and fabrication of functional devices and sensors.