Au Nanoparticle Monolayer Blanketed with Wrinkled MXene Monolayer for High Sensitive Surface Enhanced Raman Scattering (SERS) Substrate

호정원, 유필진[†]

성균관대학교

(pjyoo@skku.edu[†])

The mechanisms for increasing the Raman signal using the SERS substrate are electromagnetic mechanism (EM) and charge transfer (CT), and when both are used simultaneously, tremendous amplification effects can be achieved. In order to use EM and CT at the same time, the Fermi energy level of CT and the target molecule must be close to the substrate where the CT occurs, and since there must be many target molecules located in the hot spot for EM, the material and structure of the substrate is the key factor. Therefore, we deposited MXene 2D nanosheets on Au nanoparticles (AuNP) to adjust the Fermi level of the surface from 5.3 eV to 4.5 eV, and confirmed that Rhodamine B solution as a target molecule. In addition, the wrinkled structure makes it easy for the target molecule to access the hot spot while receiving the CT effect. When Rhodamine B was used as the analysis solution, the value of the enhancement factor was 1.6×10^{10}. MXene is expected to be used in a wide range of detection applications as a large number of molecules can bind due to functional groups located outside the SERS substrate, it is anticipated to utilized at wide range of detecting field.