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Abstract: Recently, considerable efforts have been made to prepare Surface-enhanced Raman scattering (SERS) nanostructures with high sensitivity and good reproducibility, which are always difficult and costly. In this article, we provide a simple route on the synthesis of silver particles with a novel single {111} plane and triangular morphology by reducing silver nitrate with poly(vinyl pyrrolidone) (PVP) in N,N-dimethylformamide (DMF) solutions. The results show that the Raman intensities of rhodamine 6G (R6G) decrease with decreasing the loading concentration and that R6G loading follows the first-order adsorption kinetics. Even at a low concentration of 10^{-12} M, the signatures of R6G in Raman spectrum are still clearly observed. It indicates that the silver triangular platelets (i.e. AgTP) can offer sufficient active sites to efficiently capture the R6G molecules from the loading solution, and exhibit high SERS sensitivity. In addition, the relative standard deviation (RSD) of band at 1650 cm^{-1} is calculated to be 13.7%, 12.7%, 15.7%, 15.1%, 13.3%, and 13.1%, respectively, corresponding with the concentration of R6G from 10^{-6} M to 10^{-12} M, which reveals the nanometer-scale AgTP can provide abundant hot spots and exhibit excellent reproducibility. This method offers an easy and low-cost way to prepare AgTP substrates and makes SERS detection more practicable.

Keyword: Surface-enhanced Raman scattering, silver, triangular morphology, reproducibility