

Supplementary Information

Rapid and simple detection of pethidine hydrochloride injection using surface-enhanced Raman spectroscopy based on silver aggregates

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Figure S1 shows the Raman characteristic peaks intensity (1001cm^{-1}) from 37 times successive detection, and SERS spectra were collected successively every 5 seconds under the optimum experimental conditions. It is obvious that Raman characteristic peak intensity remained almost stable within two minutes. Therefore, the SERS spectra are collected over that time to avoid long time exposure under a laser heating effect.

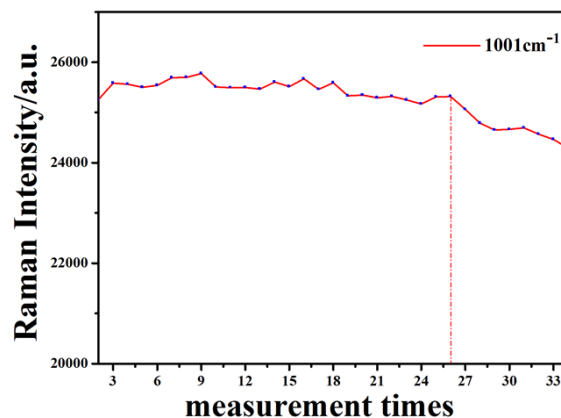


Figure S1. The Raman characteristic peak intensity (1001cm^{-1}) from 37 times successive detection every 5 seconds under the optimum experimental conditions.

In order to demonstrate that KI played an important role in this experiment, SERS spectra of pethidine hydrochloride injection with KI (blue line) and without KI (red line) as an aggregation agent were collected (Fig S2). Although pethidine hydrochloride injection could also induce the aggregation of bare silver colloid, an apparent SERS signal from pethidine hydrochloride injection without KI as aggregation agent was not observed (red line). Therefore, KI played an important role to activate silver nanoparticle.

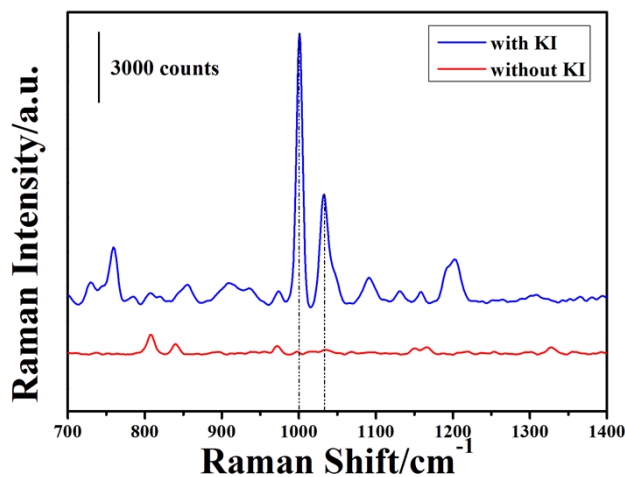


Figure S2. SERS spectra of pethidine hydrochloride injection with KI (blue line) and without KI (red line) as aggregation agent.

The pH variation of the Ag NP colloid after the addition of analysts may influence Ag NP aggregation principle, and lead to obvious changes for the Raman characteristic frequency as well as intensity. Therefore, a certain amount volume of different concentrations of NaOH and HNO₃ are added to adjust the PH of the system under the optimum experimental conditions, and SERS spectra of pethidine hydrochloride standard stock solution (100 μg mL⁻¹) under different PH were collected (Fig S3). It is worth noting that peak areas at 1001 cm⁻¹ after adding acid-base reagent is declined instead of enhanced. In general, the SERS enhancement effect is best under the neutral experimental environment.

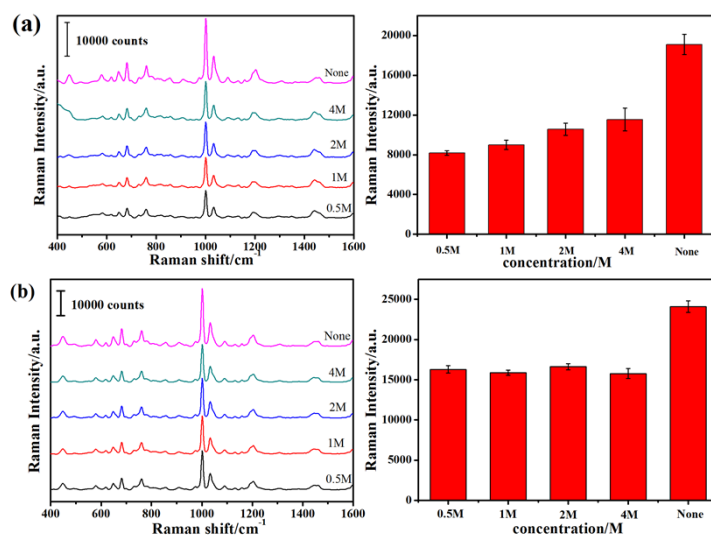


Figure S3. SERS spectra of pethidine hydrochloride standard stock solution (100 μg mL⁻¹) under different PH adjusted by NaOH (a) and HNO₃ (b), and the intensity of Raman characteristic peak at 1001cm⁻¹, respectively.