Preparation of SERS substrate in microfluidic chips and its application for dopamine detection

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Abstract This paper reports the preparation of SERS substrate in microfluidic channels by electrostatic assembly, and quantitative detection of dopamine for high sensitivity and uniformity was achieved by using of the microfluidic-SERS system .

A schematic view of the microfluidic-SERS system is illustrated in Figure 1. Firstly, silver nanostars were prepared by reducing silver nitrate with hydroxylamine and sodium citrate[1], and the TEM image is shown in figure 2. Then stable and sensitivity SERS substrate was successfully prepared in microfluidic chips by the electrostatic interaction between positively charged PDDA and negatively charged Ag nanostars. 4-MBA was selected as a raman reporter to test the sensitivity and reproducibility of the substrate.

Dopamine is a kind of important neurotransmitters in the body, which is able to adjust the mood of individuals, and it is proved that diseases such as Parkinson's disease and depression is associated with dopamine levels in the human body[2,3]. Understand the exact dopamine concentrations in the human body can help the treatment of diseases such as Parkinson's disease. using the prepared microfluidic-SERS system described above, we have successful achieved label-free detection of dopamine. Utilizing 4-MBA as raman reporter, Aptamer-based dopamine qualification was also applied in this system, figure 3 shows the result which exhibit high sensitivity and wide linear range from picomolar to micromolar concentration.

Acknowledgment

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Reference

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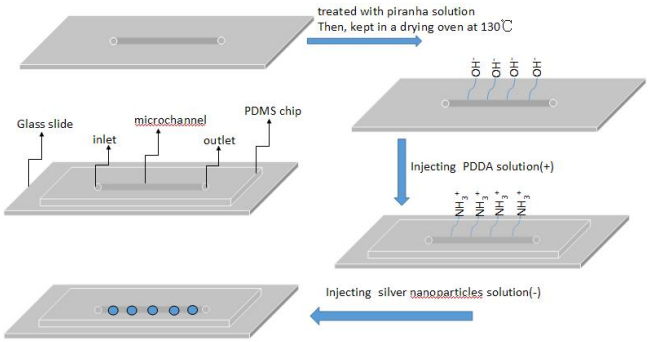

Fig. 1. Shematic diagram of the preparation of SERS substate in microfluidic channels.

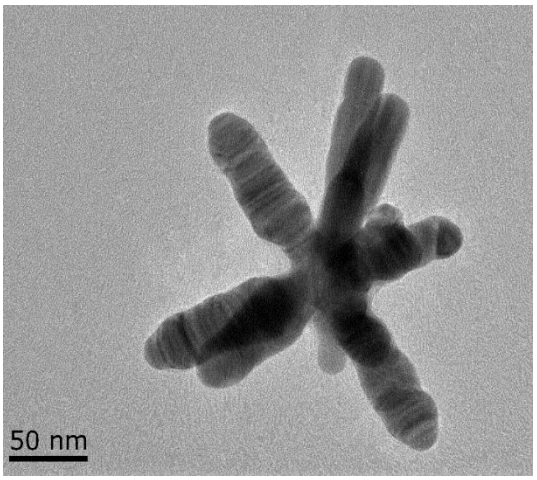

Fig. 2. TEM image of silver nanostars.

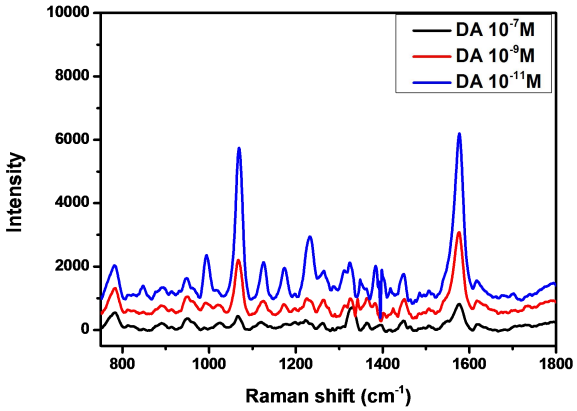

Fig. 3. SERS spectrum for different DA concentration.