BRIC

인쇄 닫기

강태준(Taejoon Kang)
한국생명공학연구원

Chem. Eng. J., Available online 20 May 2022 | https://doi.org/10.1016/j.cej.2022.137085

Sensitive and reproducible detection of SARS-CoV-2 using SERS-based microdroplet sensor

Authors and Affiliations

Sohyun Park [a], Chang Su Jeon [b], Namhyun Choi [a], Joung-Il Moon [a], Kang Min Lee [a], Sung Hyun Pyun [b,*], Taejoon Kang [c,*], Jaebum Choo [a,*]

[a] Department of Chemistry, Chung-Ang University, Seoul 06974, South Korea [b] R&D Center, Speclipse Inc., Seongnam 13461, South Korea [c] Bionanotechnology Research Center, Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon 34141, South Korea

*Corresponding authors.

Abstract

Surface-enhanced Raman scattering (SERS)-based assays have been recently developed to overcome the low detection sensitivity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SERS-based assays using magnetic beads in microtubes slightly improved the limit of detection (LoD) for SARS-CoV-2. However, the sensitivity and reproducibility of the method are still insufficient for reliable SARS-CoV-2 detection. In this study, we developed a SERS-based microdroplet sensor to dramatically improve the LoD and reproducibility of SARS-CoV-2 detection. Raman signals were measured for SERS nanotags in 140 droplets passing through a laser focal volume fixed at the center of the channel for 15 s. A comparison of the Raman signals of SERS nanotags measured in a microtube with those measured for multiple droplets in the microfluidic channel revealed that the LoD and coefficient of variation significantly improved from 36 to 0.22 PFU/mL and 21.2% to 1.79%, respectively. This improvement resulted from the ensemble average effects because the signals were measured for SERS nanotags in multiple droplets. Moreover, the total assay time decreased from 30 to 10 min. A clinical test was performed on patient samples to evaluate the clinical efficacy of the SERS-based microdroplet sensor. The assay results agreed well with those measured by the reverse transcription-polymerase chain reaction (RT-PCR) method. The proposed SERS-based microdroplet sensor is expected to be used as a new point-of-care diagnostic platform for quick and accurate detection of SARS-CoV-2 in the field.

논문정보

- 형식: Research article
- 게재일: 2022년 05월 (BRIC 등록일 2022.05.26)
- 연구진: 국내연구진
- 분야: Nanobio