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Detection of Telomerase Activity as Cancer Biomarker Using Nanogap-Rich Au Nanowire SERS Sensor

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Abstract : Telomerase activity is overexpressed in over 85% of human cancers while suppressed in normal somatic cells. Telomerase has been attracted as a universal cancer biomarker. Therefore, the development of effective telomerase activity detection methods is urgently demanded in cancer diagnosis and therapy. Herein, we report a nanogap-rich Au nanowire (NW) surface-enhanced Raman scattering (SERS) sensor for detection of human telomerase activity. The nanogap-rich Au NW SERS sensors were prepared simply by uniformly depositing nanoparticles (NPs) on single-crystalline Au NWs. We measured SERS spectra of methylene blue (MB) from 60 different nanogap-rich Au NWs and obtained the relative standard deviation (RSD) of 4.80%, confirming the superb reproducibility of nanogap-rich Au NW SERS sensors. The nanogap-rich Au NW SERS sensors enable us to detect telomerase activity in 0.2 cancer cells/mL. Furthermore, telomerase activity is detectable in 7 different cancer cell lines whereas undetectable in normal cell lines, which suggest the potential applicability of nanogap-rich Au NW SERS sensor in cancer diagnosis. We expect that the present nanogap-rich Au NW SERS sensor can be useful in biomedical applications including a diverse biomarker sensing.

Keywords : cancer biomarker, nanowires, surface-enhanced Raman scattering, telomerase
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