

Integration of a Fiber-based Cell Culture and Biosensor for in situ Monitoring of Protein Markers Secreted from Stem Cells

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We propose a new platform that can integrate a three-dimensional cell culture scaffold and a surface-enhanced Raman spectroscopy (SERS)-based biosensor by stacking them to form a multilayer system, which would allow in situ monitoring of the protein markers secreted from cultured stem cells without periodic cell and/or media collection. The cell culture scaffold supported the proliferation and osteogenic differentiation of adipose-derived mesenchymal stem cells. The SERS capture substrate detected protein markers in combination with the SERS tag made with Au-Ag alloy nanoboxes. Incorporating the different Raman reporters into the SERS tag allowed easy identification of target proteins for multiplex assays. When one ADSC culture scaffold and multiple SERS capture substrates were integrated into differentiation culture media, our system was sensitive to monitor time-dependent secretion of three different osteogenic protein markers from ADSCs during their osteogenic differentiation.