

Hydrogel-framed Nanofiber Matrix Integrated with a Microchip Device for Fluorescence Detection of Matrix Metalloproteinases-9

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Matrix metalloproteinases(MMPs) play a pivotal role in regulating composition of extracellular matrix and vascular disease, and cancer progression. Here, we designed peptide immobilized nanofiber based MMP-9 biosensor through fabrication of insertable PEG micropatterned nanofiber sheet. To fabricate freestanding and insertable nanofiber sheet into microchip, PEG hydrogel micropatterned PS/PSMA fibers were fabricated from PEG-DA(575) using photolithography. Because of PSMA copolymer nanofiber containing maleic anhydride(MA), nanofiber surface could form easily covalent bonds with MMP-9 specific peptide(Arg-Ser-Trp-Met-Gly-Leu-Pro-Gly-FITC). The peptide immobilized nanofiber sheets were inserted through reaction chamber of reusable microchip. In a MMP-9 assay, the saturation time was 30min and the detection limit was approximately 10pM, which is better than previous methods. These results indicated that the countless capture sites of nanofiber substrates enhanced performance in sensitivity and the blinding kinetics of microchip enhanced performance speed. Moreover, our biosensor can be applied in detecting various proteases and simultaneous multiplex protease assays.