Microfluidic enzymatic-reactors using carbon nitride supports for rapid protein identification

이은주, 전영시, 홍원희*
한국과학기술원
(whhong@kaist.ac.kr*)

Protein identification through peptide mass mapping by matrix-assisted laser desorption/ionization time-of-flight mass spectroscopy (MALDI-TOF MS) has become a standard technique. The traditional method ology often includes long incubations (6-24h) and extensive manual steps. An on-chip enzymatic reactor proving rapid protein digestion is presented. Mesoporous carbon nitride was utilized as a supporting material for trypsin. Trypsin was immobilized on mesoporous graphitic carbon nitrides hollow spheres to generate a biocatalyst for protein digestion. Due to the abundant surface amine functionality, high loading of trypin (998 mg/g) on supports was achieved. Immobilized trypsin-embeding stationary phase within microchannel was prepared using in-situ photopolymer as a frit in microchannel., enabling in-situ digestion of proteins such as cytochrome C and myoglobin. The generated peptides were analyzed and identified by mass-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS). This carbon nitride integrated microfluidic device has the advantages of short digestion time with retention of enzymatic activity, reuse of enzyme and could be combined with other on-chip processes.