HUPO Vancouver 2015

PO2.18 Poster

Trypsin Coated Polymer Nanofibers and Its Application to Protein Digestion under the Pressure Cycle

Daeho Shin[1], Han Sol Kim[2], Jungbae Kim[2]
[1]BMTech Medial Co. Ltd., Seoul, Korea, [2]Chemical and Biological Engineering, Korea University, Seoul, Korea

Introduction and Objectives:

Trypsin (TR) is an enzyme, which selectively
cleaves the protein sequence and make peptide fragments. This process, called protein digestion, is one of the key steps in proteomic analysis. After trypsin digests protein sample into peptide fragments, they can be analyzed via MALDI-TOF or LC-MS/MS. The current technology of protein digestion in proteomic analysis is time-consuming, tedious and not-automated due to the poor stability and autolysis of trypsin. To improve the efficiency of the protein digestion process, trypsin was immobilized and stabilized on polystyrene-based nanofiber (NF) with enzyme coating approach (EC-TR/NF).

Methods:

Polystyrene-based nanofiber was synthesized by electrospinning polystyrene and poly(styrene-co-maleic anhydride). EC-TR/NF was fabricated via simple two-step process, which consists of attachment of seed enzymes onto the surface of NFs and the crosslinking of trypsin molecules with seed enzymes. Results and Discussion: EC-TR/NF effectively prevented both denaturation and autolysis of trypsin and its high stability might be resulted from the multipoint covalent linkages formed among the trypsin molecules. Highly-stable EC-TR/NF was employed for the digestion of protein samples. During the protein digestion process, external energy, such a pressure cycle, was applied to reduce the processing time. As a result, rapid digestion of protein was achieved while EC-TR/NF maintained its proteolytic activity under the application of external energy due to its stability.

Conclusion:

EC-TR/NF can be an appealing option not only for the protein digestion platform with high performance, good stability and long lifetime, but also for other applications where the poor stability of enzyme is a critical drawback