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Dipeptide Functionalized Nanoporous Anodic Aluminium Oxide Membrane for Capturing Small Molecules

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Abstract : The rapid growth of interest in surface modification of nanostructures materials that exhibit improved structural and functional properties is attracting more researchers. The unique properties of highly ordered nanoporous anodic aluminium oxide (NAAO) membrane have been proposed as a platform for biosensing applications. They exhibit excellent physical and chemical properties with high porosity, high surface area, tunable pore sizes and excellent chemical resistance. In this study, NAAO was functionalized with 3-aminopropyltriethoxysilane (APTES) to prepared silane-modified NAAO. Amine functional groups are formed on the surface of NAAO during silanization and were characterized using Fourier Transform Infrared spectroscopy (FTIR). The synthesis of multi segment of peptide on NAAO surfaces can be realized by changing the surface chemistry of the NAAO membrane via click chemistry. By click reactions, utilizing alkyne terminated with amino group, various peptides tagged on NAAO can be envisioned from chiral natural or unnatural amino acids using standard coupling methods (HOBt, EDCI and HBTU). This strategy seemly versatile since coupling strategy of dipeptide with another amino acids, leading to tripeptide, tetrapeptide or pentapeptide, can be synthesized without purification. When an appropriate terminus is selected, multiple segments of amino acids can be successfully synthesized on the surfaces. The immobilized NAAO should be easily separated from the reaction medium by conventional filtration, thus avoiding complicated purification methods. Herein, we proposed to synthesize multi fragment peptide as a model for capturing and attaching various small biomolecules on NAAO surfaces and can be also applied as biosensing device, drug delivery systems and biocatalyst.

Keywords : nanoporous anodic aluminium oxide, silanization, peptide synthesise, click chemistry
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