Platform Technology using Polyhydroxyalkanoates (PHAs) for Protein Immobilization and Its Nanobiotechnological Applications

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Abstract

The nanobiotechnology, a new discipline that employs biological research areas such as biomolecular self-assembly, microconstruction and biocomposite fabrication offers exciting possibilities for biological and chemical analysis. By applying nanobiotechnological approach, it could be easily produced surfaces with novel functionality, better sensitivity, specificity and a higher rate of recognition. In this aspect, polyhydroxyalkanoates (PHAs) are attractive biomaterials for the fabrication and immobilization of novel micro-scaled structures, and well-defined surfaces because of its properties.[1)]

For this purpose, we are developing the biomolecular engineering of recombinant fusion proteins that are genetically linked to PHA depolymerase binding domain[1),2)] as a capture ligand for selective immobilization onto the surface of PHA. There are some examples of combining biotechnological and nanotechnological approaches for the development of novel systems. First, for the site-specific protein immobilization, microcontact printing (μCP) was introduced onto the PHA thin films.[3)] Second, to develop novel microbead-based assay systems suitable for the analysis of protein-protein interactions, the PHA microspheres were fabricated.[4)] Third, to demonstrate that this system could be used to immobilize proteins of interest for PHA-based protein and DNA microarray, fusion protein was directly immobilized on the

PHA chip using robotic microarrayer. [Our work described in this study was supported by the National Research Laboratory Program (2000-N-NL-01-C-237) of the Ministry of Science and Technology and the Center for Ultramicrochemical Process Systems (CUPS) sponsored by KOSEF]

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