DESIGN OF NEW HIGHLY FUNCTIONAL POLYMER GRAFTED POLYHIPES FOR PROTEINS IMMOBILIZATION.

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Abstract

PolyHIPE have proven to be useful in a large variety of applications included column filtration/separation, supported organic chemistry, as media for tissue engineering and 3D cell culture.[1] The ability to conveniently modify pHIPE surfaces with functional groups is essential to opening new applications areas. The most promising method to conveniently modify pHIPE surface with a high density of functional groups is the "grafting from" approach. Stable polymer brushes covalently attached to the surface posses excellent mechanical and chemical robustness and offer the flexibility to introduce a large variety of functional monomers.[2] We developed a new and unique pHIPE platform by incorporation of a polymerizable monomer with amino group into the HIPE available for different post *in situ* polymerization. The pHIPE with amino groups on the surface (pHIPE-NH_2) can be directly used for the ring opening polymerization of amino acids N-carboxyanhydrates (NCAs) monomers to make pHIPE-*g*-polypeptide (such as pHIPE-*g*-poly(L-Benzyl Glutamate)) or easily converted to an atom transfer radical polymerization (ATRP) initiator for activators generated electron transfer (AGET) ATRP of *tert*-Butyl acrylate monomers. The polymers grafted can be deprotected to form pHIPE-*g*-poly(glutamic acid) or pHIPE-*g*-poly(acrylic acid) with reactive groups, on the surface of the pHIPE, available for further bioconjugation. This was conceptionally shown by the covalent immobilization of fluorescent proteins such as enhanced green fluorescent protein (eGFP) or coral-derivated red fluorescent protein (DsRed) onto the acid functionality of poly(glutamic acid) or poly(acrylic acid) coating polyHIPE (Figure 1). Applying this approach to the immobilization of proteins with specific bioactivity this opens opportunities to develop novel advanced materials.

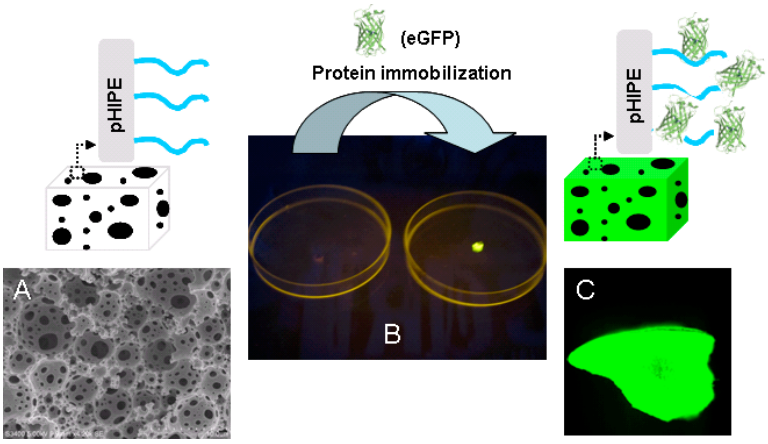

Figure 1: Scheme of the protein immobilization onto functional polyHIPE surface, A) SEM picture of pHIPE-*grafted*-Functional polymer, B) Picture of the functional pHIPE exposed to a blue light source before and after eGFP immobilization, C) Fluorescent microscopy picture of functional pHIPE labelled eGFP.

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