The main goal of the presented project is to evaluate impact of polymer tacticity on protein adsorption as well as orientation and conformation of adsorbed molecules.

Tacticity in polymers is one type of stereoregular forms in molecular configurational structures observed especially for vinyl polymers. There are three tactic forms in polymers: isotactic, syndiotactic and atactic. Isotactic is when the adjacent monomer groups were added and the substituent group on the successive asymmetric carbons are projected on the same side of the polymer chain. Syndiotactic is when the substituent group on the successive asymmetric carbons are projected in a regular alternation on both sides of the plane in the polymer chain. Finally, atactic is when the successive asymmetric carbons are projected randomly on both sides of the plane in the polymer chain.

Differences in polymers tacticity result in significantly different properties such as glass transition temperature, crystallinity or surface tension, which may affect strongly protein adsorption. This process depends on many different protein-surface interaction which we might selectively attenuate or amplify by changing the stereochemistry of polymers. As a result the amount of adsorbed proteins or their conformation or orientation might be controlled.

The immobilization of proteins in biologically active state on solid surface plays important role in the development of biosensors, immunoassay and protein microarrays, i.e. arrays of proteins arranged spatially in a very small space. One of numerous methods focused on controlled positioning of proteins on a broad range include phase-separation in polymer blends as protein adsorption to polymer phase domains might be highly selective, resulting in nearly prefect pattern replication. Balance between the interactions responsible for protein immobilization to the polymer surface can be affected by the exposure of different chemical groups, resulting in subtle changes of surface energy or promotion of hydrogen bonding, stemming from polymer different tacticity. Therefore systematic studies on the effect of substrate tacticity on protein adsorption are essential also for their potential applications as protein microarrays.

So far many results have been presented only for stereoregular PMMA and no further studies have been conducted for other polymers. We would like to extend these studies and perform investigation for a few polymers with different tacticity as well their blends to find main factor (crystallization, surface roughness, polar interaction, electrostatic interaction) responsible for differences in molecules behavior on polymeric surface.

The proposed studies will deal with fundamental problems concerning protein adsorption, conformation and orientation of molecules and determination of the factors driving them. With understanding how biomolecules are affected by the nature of surfaces, control of their amount, orientation and conformation can be achieved. This may give rise to an array of a new application of polymers with different tacticity e.g. as protein micro-arrays.