Crystallization of proteins on biocompatible surfaces –bare Ti and Ti covered by Polypyrrole (PPy)

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Crystallization process is known to be dependent on the way of crystal nucleation – homogenous or heterogeneous. On the other hand, heterogeneous formation of nuclei also depends on the substrate interacting with the crystallizing molecule such reducing the energy of nucleation [1]. Here we report a study of crystallization of two proteins – insulin and ferritin on polypyrrole (PPy) film surfaces compared to crystallization on Ti/TiO2 surfaces, aswell as on glass substrates as a referee.

Both Ti/TiO2 and PPy have fond application as biomaterials. Polypyrrole (PPy) is a conducting polymer, used in drug delivery systems due to its apparent biocompatibility and ease preparation [2]. Ti and its oxides have low ion-formation tendency and low reactivity with macromolecules [3]. The topography of Ti surface and PPy coating film has been studied applying AFM, scanning electron microscopy (SEM) and impedance spectroscopy.

Studies of crystallization behavior of both proteins have been performed in conditions of vapor diffusion mode, applying pending drop method. Results obtained show thatcrystallization on PPy surface is much easier compared to Ti surface, forming many well- shaped crystals, while crystallization on Ti surface is quite difficult and crystals appearing are not polygonised at the conditions of the experiment. These results are explained by the surface energy and morphology of the substrates, related to the existence of active sites of nucleation and the structure of the nuclei formed.

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References:

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