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Surface functionalization of polymers for capturing cells

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Modulating the interaction of materials with biological cells is one of the most important and most successful application areas of surface technology. Polystyrene petri dishes are sold with a surface functionalization facilitating their application as cell culture dishes. Implants receive surfaces which ease their incorporation in the body. On the other hand, antimicrobial coatings aim to prevent the colonization of the surface by microbes or even kill them.

The type and the intensity of the interactions depend on the cells as well as on the chemistry and the structure of the material's surface. The interaction can range from very specific for a certain kind of cell in the case of antibody functionalized surfaces to largely unspecific. We explored the opportunities of using tailored surfaces with a simple chemistry (i.e. no antibodies) to handle cells. It was found that surface functionalized polymer powders are able to capture a high fraction of bacteria from a liquid. These materials can be used for sample preparation in microbiological laboratories for example in cases where a small number of bacteria (e.g. 100) has to be extracted from a large volume (e.g. 1 L) of a liquid.

These powders were prepared in processes which involve the activation in a low-pressure plasma and one or more following reactions. With this general scheme surfaces can be prepared which have an acidic, basic or amphoteric character and varying densities of functional groups. In the presentation we will describe the up-scaling of the preparation process including the plasma treatment and the coupling of a functional polymer to the powder surface from an aqueous solution as well as procedures for the quality control of the products. The latter are relatively simple tests for the surface functionalization which might be useful for other applications, too.

Keywords

polymer

powder

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