

chemical surface properties and cell behaviour, provided by the present study, may help in better understanding of the phenomena at the interface of a biomaterial and its biological environment. Moreover, it may provide some idea how to modify cell behaviour by simple changing the material chemical composition.

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INFLUENCE OF SURFACE PROPERTIES OF CARBON BASED MATERIALS ON CELL SPREADING

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Abstract

Carbon materials are generally well tolerated by animal cells. The possibility of applying carbon fiber reinforced carbon (CFRC) composite materials is given by their excellent biocompatibility and porosity, coupled with a modulus which can be tailored to be similar to that of bone. This makes them an attractive material for bone plates and implants in orthopaedic and dental surgery. It is known that the volume properties of a material usually have little or no influence on the surrounding living tissue cells. In general, biocompatibility is controlled mainly by the interface between biomaterial and living tissue cells.

The literature and our study indicate that the interaction at the interface is specifically controlled by the surface morphology, (i.e., especially by surface roughness), and by the chemical state of the surface - by hydrophobia (wettability), free chemical bonds and present chemical groups, etc. Nevertheless, biocompatibility can be improved by a suitable change of these parameters. There are several possible methods for influencing the roughness and chemical state of the surface. One way to change the surface properties is by preparing a suitable coating. The properties of the surface are controlled by process technology, and the grinding and polishing of the substrate can be used for roughness control.

Till now we studied the influence of the surface on the cell adhesion and on the rate of the cell growth. There, we have studied the influence of a surface coating of CFRC using a several types of layers on the base of carbon. In our present contribution we continue in this work using the surfaces of CFRC in native and polished states, both covered by layers of amorphous carbon, or titanium with carbon or pyrolytic graphite. The vascular smooth muscle cells were grown on these surfaces. The purpose of this paper is to find the influence of the surface on the important parameter of tissue cell growth - the spreading of cells.

The main topic of this work is therefore the measurement and statistical evaluation of the cell area on the various types of surfaces. It will be shown, that the cell spreading is strongly influenced by various surface roughness and also its chemical state.

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