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Investigation on Structure and Properties of IBED-TiO_{2-x} treated by Vacuum Anneal

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Surface coating such as TiN, SiC, diamond-like carbon films etc. have been proved to be effective for improving the properties of biomaterials since last decade. Recently an improvement of blood compatibility of non-stoichiometric titanium oxide films has been reported. In this paper the behavior of blood reaction with Ti-O films of different structure was investigated.

TiO_{2-x} film was synthesized by ion beam enhanced deposition (IBED), then the samples were annealed at 700°C in vacuum for 45 min. The structure of these two kinds of TiO_{2-x} films (annealed and not annealed) was investigated by infrared spectroscopy (IR) and X-ray diffraction (XRD). Surface energy characteristics were determined by contact angle measurement. Platelet adhesion experiment was adopted to examine the interaction of blood with the films.

The results showed that rutile-TiO_{2-x} was obtained from amorphous-TiO_{2-x} by vacuum anneal treatment. The surface/interface energy characteristics of the annealed titanium oxide film were closer to the value of interfacial tension of the blood cell-medium. It could be observed that adherent platelet on the surface of annealed IBED-TiO_{2-x} film was seldom denatured and its morphology was hardly changed comparing with amorphous titanium oxide film. So the vacuum anneal treatment improved the adhesion behavior of platelet on IBED-Ti-O film due to the change of the structure and surface energy characteristics of the films.

Keywords biomaterial, ion beam enhanced deposition (IBED), Titanium oxide film, vacuum anneal

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