STRUCTURE OF PYROLYTIC CARBON THIN FILMS DEPOSITED ON Al_2O_3 AND ZrO_2 SUBSTRATES

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Pyrolytic carbon is an interesting material because of its low thrombogenicity, which makes it the ideal candidate for heart valve prostheses. For more than thirty years mechanical heart valve manufacturers have used pyrolytic carbon in valve construction. These pyrolytic carbons have been alloyed with silicon carbide to maintain consistent hardness and improve properties such as stiffness, hardness and wear resistance. Silicon carbide, however, also compromises biocompatibility in medical products. Despite its high biocompatibility, pyrolytic carbon has so far been used only in small joints (fingers) and extending its use to large implants (hip) has been found to be troublesome because pyrolytic carbon is deposited on a low strength substrate and has a high residual stress due to the coating process.

An alternative to these systems would be the hybrid carbon/oxidic ceramic (alumina, zirconia) nanocomposites that combine excellent mechanical properties of both systems together with their biocompatibility. For this reason, studying the growth mode, the microstructure, and how to release the residual stress in pyrolytic carbon films on alumina and zirconia is a key parameter for the development of future carbon based joints and heart valves. In this work, the microstructure of pyrolytic carbon, deposited by chemical vapour deposition, on alumina and zirconia substrates has been studied and compared to the microstructure of pyrolytic carbon deposited on Au (Pt?) thin films.