Cellular and Molecular Problems of Hemo- and Biocompatibility of Diamond-Like Carbon Films: A Brief Critical Review

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Thin amorphous films consisting of sp^3 (diamond) and sp^2 (graphite) hybridization of carbon atomic orbits and named therefore diamond-like carbon (DLC) have been reviewed according to the publications in the past two decades. A connection of biomedical and physical-chemical features of analyzed coatings was focused, mainly. The methods of coating depositions and general criteria to DLC films for cardiovascular implants, in vitro reaction of blood proteins, thrombocytes, leukocytes, fibroblasts, endothelial and smooth muscle cells, and cellular and molecular aspects of hemo- and biocompatibility influenced by DLC films doped with silicon and its oxides have been provided. Wide variation of physical-chemical, mechanical and tribological properties of DLC films, a scatter of methods of their in vitro biomedical testing make it impossible to determine the most relevant coatings for specific applications in the field of stents, cardiac valves, and blood pumps. A necessity of shift of emphasis from discrete fundamental investigations of DLC films to applied elaborations as well an observation of certain coating behavior based on the engineering, biomechanical, physical-chemical, and biomedical specifications for each type of devices contacted with blood has been concluded.s

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