Recently, nanotechnology in tissue engineering has become a very important field of study. Many different materials of nanoscale roughness have been studied for their potential use in the regeneration of various tissues. The reason is that nanostructured materials imitate the architecture of natural extracellular matrix and thus support cell adhesion, growth and differentiation. Our investigations were focused on the influence of fullerene layers, carbon nanotube-terpolymer composites and nanocrystalline diamond layers on the adhesion, growth and differentiation of human osteoblast-like MG 63 cells. Each of these materials supported colonization with cells. On continuous fullerene C60 layers, deposited on composites with the carbon matrix reinforced with carbon fibres, the cell population density was lower than on non-coated composites, but MG 63 cells were well-spread with well-developed vinculin-containing focal adhesion plaques and a beta-actin cytoskeleton. On composites of carbon nanotubes with a terpolymer of polytetrafluoroethylene, polypropylene and polyvinyldifluoride, the adhesion, spreading, formation of focal adhesion plaques and actin cytoskeleton, viability and cell growth were markedly improved in comparison with pure terpolymer. At the same time, these cells did not show significant immune activation, as measured by the concentration of an immunoglobuline adhesion molecule ICAM-1. Nanostructured and especially hierarchically micro- and nanostructured nanocrystalline diamond films markedly supported the adhesion, growth, viability and metabolic activity of MG 63 cells. These films seem to be the most promising for practical applications, such as construction of bioactive coatings of bone implants.