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Title of the lecture: The interaction between Endothelial Cells and Gallium Nitride nanoparticles

Abstract
In this study, human umbilical vein endothelial cells (HUVECs) were investigated in direct contact with Gallium Nitride (GaN/Fe) based nanoparticles. GaN is a compound semiconductor material, with remarkable characteristics including piezoelectric properties, high thermal stability, radiation hardness and excellent chemical inertness, which make it promising for biomedical applications. There is, however, limited knowledge about the biocompatibility of nanostructured GaN and the impact of GaN nanoparticles on living cells. We report on growth and characterization of GaN/ZnFe2O4 multifunctional piezoelectric and magnetic nanoparticles as well as on their assimilation and interaction with HUVECs. Thin GaN layers were grown on ZnFe2O4 nanoparticles with sizes up to 100 nm, using Hydride Vapor Phase Epitaxy (HVPE). After GaN growth, the sacrificial core of nanoparticles was decomposed at high temperatures in hydrogen flow, the final composition of nanoparticles corresponding to GaN:Fe. The resulted nanoparticles were incubated with human umbilical vein endothelial cells in order to remotely influence the cells activity through nanoparticles. By cultivating cells in medium supplemented with different concentrations of nanoparticles, we show that HUVECs tolerate GaN nanoparticles. The obtained results show that, being uptaken by the cells, the GaN nanoparticles are deposited into vesicles and thus can be used as guiding elements for controlled transportation or designed spatial distribution of cells in a magnetic field, which represent a step forward towards application in cellular therapy.