

MATERIALS ENGINEERING

SEMINAR

“Scalable Manufacturing of Sensors and Biomedical Devices via All Laser Enabled Patterning and Surface Functionalization”

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Purdue MSE Preliminary Exam

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ABSTRACT

Among different metal surface micro/nano texturing processes, laser-assisted technologies provide a unique possibility to selectively alter both the physical and chemical properties of the metal with high resolution and repeatability while also eliminating the need of complex and wasteful chemical procedures. Here we demonstrate a survey of laser-material interaction and how the processing conditions can alter the final surface microstructure and chemical properties of different metallic surfaces. This survey will also provide information on how laser-assisted structural and chemical alterations could be utilized for developing efficient nanostructures for various applications. Next, we review applying such processes for rapid production of sensors, and surface functionalization of orthopedic implants to enhance wettability and cellular integration with high antibacterial properties. We provide our preliminary results on the characterization and investigation of rapid laser-induced nickel and copper oxide micro/nanostructures for glucose detection which includes a systematic study of the effect of laser-processing conditions on the final chemical composition and electrochemical efficiency of the laser processed surface. Finally, future work plans are discussed, including the use of laser-assisted interstitial alloying on metal surfaces as a selective surface modification process of different metals for potential use in biosensors and implantable devices.

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