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Surface Modifications of Biomedical Devices

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Magnesium (Mg) is a biodegradable and bioresorbable metallic implant and has received massive interest in cardiovascular and bone applications as it has unique mechanical and biodegradable properties besides its excellent biocompatibility. However, because it possesses a rapid degradation rate, hydrogen gas evolution from Mg surface renders its clinical applications. The interactions between the surrounding tissues and biomaterials are directly associated with the surface characteristics of the biomedical devices. Surface modification is one of the most efficient ways to improve the surface properties of biomedical devices and endow them with new functions. Many attempts have been made for enhancing the biodegradable polymers functionalities, using surface topography and chemistry. In this study, electrospun biodegradable polymer nanofibers mats were fully masked with bioactive nanoceramics to stimulate bone formation capabilities. Because of the poor mechanical properties and wettability of poly (lactic acid) (PLA) electrospun fibers, a thin layer of Polyvinyl alcohol (PVA) was deposited on each single PLA nanofibers to enhance the mechanical and wettability properties, thanks to its biocompatibility was improved. We have successfully depressed the rapid degradation of Mg by several coating strategies with further enhancement its biological functionality. Similarly, titanium surface was improved by enhancing osseointegration functionality with the surrounding natural bones.