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Synthesis of PLGA /nano-ZnO composite particles for biomedical applications

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Copolymer poly (DL-lactide-co-glycolide) (PLGA), due of its biodegradable and biocompatible nature, is widely used in various medical applications; controlled release of delivering drugs, carriers in the tissue engineering, etc. On the other hand, zinc oxide (ZnO) is extensively used in medicine and pharmacy for personal care products, as well as in biomedical materials like dental composites, as a material for treatment of a variety of skin irritations, to enhance the antibacterial activity of different medicaments, etc. In this research we have dealt with a procedure to prepare particles of poly (lactide-co-glycolide) and nano zinc oxide (PLGA/nano-ZnO). Nano-ZnO has been synthesized using a microwave synthesis method and additionally immobilized within PLGA by physicochemical solvent/non-solvent method. Firstly, ZnO has been dispersed in acetone and then additionally added dropwise in the PLGA/ethyl acetate (PLGA/nano-ZnO(EtAc) or PLGA/acetone (PLGA/nano-ZnO(Ac)) solutions, respectively. The as-prepared dispersions were dried in air atmosphere for 24 h.

The characterization of the prepared samples was performed using X-ray powder diffraction (XRPD) method for the structure properties, field emission scanning electron microscopy (FE SEM) for the investigation of particles morphology, as well as Malvern's Mastersizer instrument for particle size distribution. DTA-TG measurements were performed in order to investigate the samples thermal stability and mass loss percentage. The antimicrobial behavior of the synthesized PLGA/nano-ZnO particles was tested against gram-negative and gram-positive bacteria cultures and also against *Candida Albicans*, diploid fungus.