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Program & Abstracts

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p240 Antimicrobial Properties of Copper Plasma-Implanted Polyethylene

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Polyethylene (PE) is common medical polymer. Like other polymers, the surface properties such as antibacterial capability degrade with time due to the high atomic mobility. In this work, plasma immersion ion implantation (PIII) was employed to introduce a nano-copper interlayer into polyethylene to improve the antibacterial properties and durability of the materials. The implanted PE was characterized by X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and atom force microscopy (AFM). Our results show that the implanted copper atoms form a buried nano-interlayer with very little copper deposited on the surface. This is mainly due to the proper synchronization between the cathodic arc plasma and sample voltage pulses. The implanted copper has two chemical states, Cu and Cu⁺ and the surface morphology is not altered after PIII as revealed by AFM. After the implanted PE was kept at 80°C for 5 hours, congregation and crystallization of the implanted copper did not take place, indicating excellent stability with time. The antibacterial properties of the materials are also improved.