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Voltage Polarity in Electrospinning: Way to Control Surface Properties of Polymer Fibers

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Abstract : Surface properties of materials are the key parameter in many applications, especially in the biomedical field, to control cell-material interactions. In our work, we want to achieve the controllability of surface properties of polymer fibers via a single-step electrospinning process by alternating voltage polarities. Voltage polarity defines the charge accumulated on the surface of the liquid jet and the surface of the fibers. Positive polarity attracts negatively charged groups to fibers' surface, whereas negative polarity moves the negatively charged functional groups away from the surface. This way, we can control the surface chemistry, wettability, and additionally surface potential of electrospun fibers. Within our research, we characterized surface chemistry using X-ray photoelectron microscopy (XPS) and surface potential with Kelvin probe force microscopy (KPFM) on electrospun fibers of commonly used polymers such as PCL, PVDF, and PMMA, often used as biomaterials. We proved the significant effect of fibers' surface potential on cell integration with the scaffolds and further cells development for the regeneration processes based on the osteoblast and fibroblast culture studies. Acknowledgments: The study was conducted within 'Nanofiber-based sponges for atopic skin treatment' project, which is carried out within the First TEAM programme of the Foundation for Polish Science co-financed by the European Union under the European Regional Development Fund, project no POIR.04.04.00-00- 4571/18-00.

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