NaOH treated micro fibrous polyethylene terephthalate mats for biomedical application

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Recently micro-fibrous polyethylene terephthalate (PET) nonwovens have attracted attention for their potential in biomedical applications. NaOH treatment has been used as a simple and cost effective method for their surface functionalization; however, their physical and mechanical properties have been poorly studied. This study reports the physical and tensile characterization of NaOH treated micro-fibrous PET mats. PET webs with an average fiber diameter of 6 µm and 10 µm were produced by melt blowing process and the fibrous PET mates were fabricated using consolidation of a desired number of melt blown PET web layers. PET mats with a fiber diameter of 0.7 and 1.5 µm were also produced by using electro-spinning. The mats were treated using NaOH 1N at 65ºC in various times (ranging from 20 min to 24 h). The morphology and tensile properties of the mats was evaluated using SEM and micromechanical tester respectively. By increasing treatment time, pores appeared on the surface of individual fibers, and weight loss increased; tensile stress and young modulus decreased; tensile strain of the melt blown mats increased while that of the electro-spun mats decreased. Mats with different fiber diameter showed different fiber surfaces features, tensile properties, weight loss, porosity, thickness and shrinkage, depending on the treatment time. These findings demonstrated that by NaOH treatment of PET fibrous structures, it is possible to alter their physical and mechanical properties, and may also make them favorable for biomolecule immobilization and subsequent cell adhesion. These materials have potential for biomedical applications including scaffolding materials for tissue engineering, particularly small diameter vascular graft.