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Engineering Multi-scale Electrospun Structure for Integration into Architected 3-D Nanofibers for Cimex Annihilation: Fabrication and Mechanism Study. SHAN HE, LINXI ZHANG, stony brook university, YING LIU, Advanced Energy Research and Technology Center, MIRIAM RAFAILOVICH, Stony Brook University, GARCIA CENTER FOR POLYMERS AT ENGINEERED INTERFACES TEAM — In this study, engineered electrospun scaffolds with fibers oriented with designed curvature in three dimensions (3D) including the looped structure were developed based on the principle of electrostatic repulsion. Here we illustrate that 3D electrospun recycled polystyrene fibers could closely mimic the unique architectures of multi-direction and multi-layer nano-spiderweb. In contrast to virgin PS, the recycled PS (Dart Styrofoam) are known to contain zinc stearate which acts as a surfactant resulting in higher electrical charge and larger fiber curvature, hence, lower modulus. The surfactant, which is known to decrease the surface tension, may have also been effective at decreasing the confinement of the PS, where chain stretching was shown to occur, in response to the high surface tension at the air interface. Three dimensional flexible architecture with complex structures are shown to be necessary in order to block the motion of Cimex lectularius. Here we show how an engineered electrospun network of surfactant modified polymer fibers with calculated dimensions can be used to immobilize the insects. The mechanical response of the fibers has to be specifically tailored so that it is elastically deformed, without fracturing or flowing. Carefully controlling and tailoring the electrospinning parameters we can now utilize architected 3D nanofiber to create an environmental-friendly Cimex immobilization device which can lead to annihilation solution for all the other harmful insects.

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