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Design of Free-Standing Microstructured Conducting Polymer Films for Enhanced Particle Removal from Non-uniform Surfaces JENNIFER LASTER, NICHOLAS DEOM, BRYAN BOUDOURIS, STEPHEN BEAUDOIN, Purdue University — Particle removal from surfaces is important for a wide range of industrial applications (e.g., microelectronics fabrication). One of the main forces of particle adhesion to a surface is the van der Waals attraction force, which will be the focus of this effort. The surface features of interacting bodies can play a controlling role in the adhesion of particles by increasing or decreasing the amount of mass within the range of strong van der Waals forces. In order to control these interactions, specific geometries can be designed in order to manipulate the micro- and nanostructure of a material, which can conform to the features of a corresponding substrate increasing the overall contact area between the two surfaces. In this work, microstructured films of the conducting polymer polypyrrole (PPy) were synthesized through template-assisted electropolymerization techniques. The removal of fluorescently-labeled polystyrene beads from aluminum surfaces of varying roughness was measured and compared for microstructured and flat PPy films. The microstructured films were found to have an overall increase in the amount of particles removed from the aluminum surfaces; this demonstrates the ability to manipulate particle adhesion through advanced nanostructured polymer templating.

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