142al Chemical Vapor Deposition Copolymerization of Functionalized Paracyclophanes: an Approach Towards Multivalent Surface Coatings

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Chemical vapor deposition of substituted [2.2]paracyclophanes relies on polymerization from the vapor phase and has unique features when compared to other, solvent-based surface modification techniques, such as high form fidelity and excellent adhesion to a wide range of substrate materials. In addition, a wide range of reactive surface coatings can be prepared via CVD polymerization of substituted [2.2]paracyclophanes. In the past, a range of functionalized poly-*p*-xylylenes was synthesized, and their usefulness for patterning of proteins, cells, and nanoparticles was demonstrated. Moreover, functionalized poly-*p*-xylylenes were used as functional coatings for biomedical implants and microfluidic assay devices. Herein, we report the first successful co-polymerization of two substituted [2.2]paracyclophanes with functional groups of orthogonal reactivity. The vapor-based co-polymerization yielded poly[(4-amino-*p*-xylylene)-co-(4-trifluoroacetyl-*p*-xylylene)-co-*p*-xylylene]. The chemical composition of the resulting polymer film was verified using X-ray photoelectron spectroscopy. In addition, IR spectroscopy verified the presence of both functional groups, amines and ketones, in the polymer. Although X-ray diffraction initially suggests an amorphous film structure, annealing at 200 ^{o}C induces crystallinity in the copolymer films. Application of biotin pentafluorophenol ester and biotin hydrazide yielded selective reactivity with the amine and trifluoroacetyl groups, respectively, showing that both functional groups are present at the surface. This finding may have implications in the areas of combination drug therapy and multivalent biomedical device coatings.