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**Effects of Surface Treatments on Nylon 6,6 via Non-thermal Atmospheric Plasma for Thermoplastic Adhesives** CHI-CHIN WU, ANDRES BUJANDA, JOHN DEMAREE, JASON ROBINETTE, AMANDA WEERASOORIYA, DAVID FLANAGAN, Army Research Laboratory, ARL PLASMA GROUP, CCEP, WMRD TEAM — This work aims to modify the properties of Nylon 6,6 surfaces for attaining improved interfacial adhesion to thermoplastic composites utilizing atmospheric non-thermal plasma treatments followed by silane treatments using 3-aminopropyltriethoxysilane (APS) in some cases. An L-shaped dielectric barrier discharge configuration was employed to expose nylon substrates to oxygen-containing gas plasmas such as $He/O_2$ and $He/H_2O$, respectively, at room temperature. The chemically-modified surface of the substrate after plasma exposure was immediately examined by static water contact angle wettability measurements and X-ray photoelectron spectroscopy. It was found that the surface hydrophilicity was substantially enhanced and the amount of surface oxygen was significantly increased after a three-minute plasma exposure due to the increased surface energy and additional O-H bonds. The enhancements on interfacial adhesion were evaluated with lap shear tests using three types of adhesives: EPON 825/D230, EPON 825/D2000 and sikaflex252, respectively. The results of tensile tests on the adhesive joints showed an almost $\sim 300\%$ increase in interfacial adhesive strength for EPON 825/D230 bonds after plasma treatments. Finite element modeling of adhesive joints for bond strength is underway to compare with experimental results and study the quantitative relations between the mechanical properties within the bond and at interfaces.

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