

THE INFLUENCE OF CARBONIZED POLYMER DOTS ON MECHANICAL PROPERTIES OF POLYURETHANE FOIL

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Nanocomposites of carbonized polymer dots (CPD) and polyurethane (PU) are promising materials. In order to use a material in a wide range of applications, it is necessary to know its mechanical properties. In this study, two CPD/PU nanocomposites, with different CPD, from citric acid/urea (CAUR) and from phloroglucinol (PHL), as well as the reference PU foil, were mechanically characterized.

CAUR-CPD was synthesized by 2.1 g of citric acid and 1.8 g of urea, dissolved in 50 mL of acetone. PHL-CPD was synthesized by 500 mg of PHL mixed in 50 mL of acetone. Both solutions were transferred to a Teflon-lined autoclave for heating. After the condensation reactions, the products of CAUR-CPD and PHL-CPD were filtered and centrifuged to remove the unreacted precursors. The CAUR-CPD/PU and PHL-CPD/PU nanocomposites were prepared by dipping PU foil (0.2 mm thick) in CAUR-CPD or PHL-CPD solution in acetone. The swelling-shrink-encapsulation method was used to encapsulate the CAUR-CPD and PHL-CPD in PU. The samples were dried in a vacuum furnace to eliminate acetone from the composites.

The mechanical properties were determined on universal testing machine Shimadzu, AG-X plus 10 kN. The samples were prepared in the form of plates with a width of 8 mm. The distance between the grips was 50 mm. The strain rate was set to 1 mm/min for determination of E modulus and to 50 mm/min until the end. Each sample was measured 5 times and the average values were taken.

The reference PU sample showed the highest elastic modulus (33.3 MPa) and tensile strength (25.8 MPa). The nanocomposites, CAUR-CPD/PU and PHL-CPD/PU, showed similar mechanical properties: a lower elastic modulus (18.8 and 18.6 MPa, respectively) and tensile strength (14.6 and 16.9 MPa) but much higher strain at break (650 and 608 %) than the reference PU foil (434 %).

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