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Graphitization Behavior of Graphene-novolac Carbon- Carbon Composites

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Carbon-carbon (C-C) composites are used in vast applications in the aerospace and automobile industry due to their light weight, mechanical strength, and durability. Present applications include door frames and roof panels in automobiles, wing flaps and disc brakes in airplanes. C-C composites consist of a carbonaceous matrix with an embedded carbon filler. Nanomaterials such as graphene and carbon nanotubes or fibers made from carbon precursors like PAN or rayon are used as fillers and are dispersed into a pitch or resin-based matrix to get desired properties. The normal role for the filler is providing mechanical reinforcement and stability, requiring only stress transfer across the matrix-filler interface. Yet during high temperature heat treatment required for C-C manufacture, the matrix and filler may interact both physically and chemically. Understanding the matrix-filler interaction is crucial in the enhancement of properties and performance of the carbon-carbon composite. In this work, graphene-novolac composites were prepared with graphene materials of varied oxygen content. The composites were characterized with XRD and TEM to understand the graphene-novolac interaction and its effect upon graphitization behavior. Structural analysis by XRD and TEM suggest synergistic reactions between the filler and matrix leading to more graphitic composite. Higher oxygen content seems to favor such graphitization tendency.

Keyword: Carbon-Carbon, Composites, Filler, Matrix, Interaction, Graphitization

Biography:

Sandra Nkiruka Ike is a PhD student/Energy and Mineral Engineering/The Pennsylvania State University. She is a second-year PhD student working with Dr. Randy Vander Wal at The Pennsylvania State University. Her research focuses on understanding graphitization behavior of carbon-carbon composites to enhance its properties and mechanical performance. For her research work, Sandra was a recipient of the Frank and Lucy Rusinko Graduate Fellowship and 1st-place winner of 2020 PPG Elevator Pitch Competition. She is also a member of the Penn State Pan-African Professional Alliance. Prior to joining Penn State, Sandra graduated with a B.Sc. in Chemistry and minor in Mathematics from Florida International University.

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