World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:12, No:02, 2018

Analysis of Solvent Effect on the Mechanical Properties of Poly(Ether Ether Ketone) Using Nano-Indentation

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Abstract : The contact performance of polymeric composites is dependent on the localized mechanical properties of materials. This is particularly important for fiber oriented polymeric materials where self-lubrication from top layers has been the basic requirement. The nanoindentation response of fiber reinforced poly(etheretherketone), PEEK, composites have been evaluated to determine the near-surface mechanical characteristics. Load-displacement compliance, hardness and elastic modulus data based on contact compliance mode (CSM) indentation of carbon fiber oriented and glass fiber oriented PEEK composites are reported as a function of indentation contact displacement. The composite surfaces were indented to a maximum penetration depth of 5μm using Berkovich tip indenter. A typical multiphase response of the composite surface is depicted from analysis of the indentation data for the composites, showing presence of polymer matrix, fibers, and interphase regions. The observed experimental results show that although the surface mechanical properties of carbon fiber based PEEK composite were comparatively higher, the properties of matrix material were seen to be increased in the presence of glass fibers. The experimental methodology may provide a convenient means to understand morphological description of the multimodal polymeric composites.

Keywords : nanoindentation, PEEK, modulus, hardness, plasticization
Conference Title : ICP 2018 : International Conference on Polymer
Conference Location : Paris, France
Conference Dates : February 19-20, 2018