

Abstract Submitted  
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**Comprehensive structural characterization and surface properties of graphene – 21<sup>st</sup> Century wonder material**<sup>1</sup> MAXWELL DIERKEN, ELI HEINTZMAN, Western Kentucky University, HARRY HEYWORTH, The Gatton Academy of Mathematics and Science, S. GUPTA, Western Kentucky University — Among the family of carbon-based systems, graphene is one of the youngest members existing in crystalline form alongside diamond, graphite, fullerenes and carbon nanotubes. Moreover, graphene is described as a one-atom thick layer of the layered mineral graphite. Graphene has attracted a great deal of attention since 2004 when it was successfully isolated through scotch-tape method furthered by other preparation methods. Since its inception, a flurry of research activities have initiated around the world attributed to their extraordinary physical (electronic, mechanical, thermal, optical and electrochemical) properties for a gamut of technologies. However, it is indispensable to investigate their structure to establish *microscopic structure-property* relationship. Here we study the structural and surface properties of graphene prepared *via* two approaches namely, exfoliation and controlled scotch-tape methods, revealing mono-, bi-, tri- and multi-layers. A range of analytical characterization techniques include optical and atomic force microscopy, transmission electron microscopy combined with electron diffraction and resonance Raman spectroscopy with mapping, have been employed determining the number of layers, surface roughness / uniformity / homogeneity, nanoscale structure through diffraction, thus assessing the quality of graphene and provides a comprehensive understanding of the structure for a range of electronic and electrochemical applications.

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S. Gupta  
Western Kentucky University

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