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Carbon Functional Nanomaterials, Graphene and Related 2D-Layered Systems

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Carbon Functional Nanomaterials, Graphene and Related 2D-Layered Systems

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PREFACE

For almost two decades now, the carbon nanomaterial (CNM) system has persistently provided researchers the opportunity for spectacular new discoveries, significant advances in fundamental and applied science, and the development of disruptive technologies and applications. The rich allotropicity of carbon bonding can explain the broad use of carbon-based materials such as carbon nanotubes (CNT), diamond, fullerenes, and more recently graphene. Today's research community continues to discover and harness new low-dimensional carbon allotropes, perhaps at a historically unprecedented rate. In this context, carbon nanotubes, nanodiamond, and graphene, have become versatile platforms for new materials properties and device architectures, and are finding their way into nearly every facet of the research world, including conductive polymers, transparent electrodes, chemical sensors, high-frequency devices, optoelectronic sensors, alternative energy, and bio-inspired systems, to name a few. At the same time, researchers from diverse disciplines are pushing the frontiers of these materials by developing innovative arrays of ribbon, hybrid, functionalized, doped, and hetero structures often resulting in dramatically new scientific and engineering directions.

The significance of CNMs is demonstrated by the daily stream of new research publications – many of which are in journals of highest impact factors – addressing a broad range of experimental and theoretical materials-related topics including synthesis, characterization, integration, and devices. Interdisciplinary topics related to the materials science, chemistry, physics, mechanics, and engineering of CNMs such as graphene, carbon nanotubes, nanoribbons, nanodiamond, graphene oxide, graphane, fluorographene, graphene composites (and many others) were the focus of these symposia, with a long-term outlook on applications of these materials.

Within these CNMs, the isolation of graphene has been a turning point which has resulted in the emergence of a new research area namely "atomically-thick 2-Dimensional systems", in which monolayers of layered materials such as BN, BCN, MoS_2, WS_2, etc., are now being isolated and studied. In contrast to the graphene gapless density of states, other 2D systems could possess well-defined and tunable electronic gaps, thus offering numerous potential applications in nanoelectronics and optoelectronics, such as sensors, logic devices, high energy rechargeable batteries, photodiodes, etc. However, there are numerous challenges that need to be overcome regarding the synthesis of mono-, bi-. tri-layers as well as their optical/electronic characterization. All these exciting developments and others, are also covered in the following contributions and we hope the reader find them

relevant and useful when carrying out fundamental research in the areas of carbon nanoscience and 2D systems.

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