

Preface

This volume contains selected invited papers presented at GraphITA (Bologna Italy September 14–18, 2015—<http://graphita.bo.imm.cnr.it>), a multidisciplinary and inter-sectorial European conference on synthesis, characterization and applications of Graphene and other 2D materials. The event was jointly organized by the CNR-IMM (Consiglio Nazionale delle Ricerche, Istituto per la Microelettronica e Microsistemi) of Bologna and the Department of Physical and Chemical Sciences of the University of L'Aquila. At variance from GraphITA 2011, this volume is focused on invited review papers mostly contributed by the invited speakers of the conference. Though, all the contributors are, in their respective fields, top players internationally acknowledged, however all the submitted papers were submitted to a peer review process.

This volume begins with closely related and complementary theoretical works on phonon, Raman scattering, and electron phonon coupling in graphene (Chapters “[Thermal Transport in Nanocrystalline Graphene: The Role of Grain Boundaries](#)”, “[Raman Spectroscopy of Graphene Nanoribbons: A Review](#)”, and “[Electron–Phonon Coupling in Two-Dimensional Superconductors: Doped Graphene and phosphorene](#)” respectively). The latter point is then reviewed with an excellent experimental contribution (Chapter “[Elastic Properties and Electron–Phonon Coupling of Graphene/Metal Interfaces Probed by Phonon Dispersion](#)”). Then, the volume proceeds with an *ab initio* study of the doping effect on graphene, to move towards the investigation of the role of defects on other 2D materials (TMDs) (Chapters “[Ab Initio Calculations and Kinetic Process Simulations of Nitrogen-Doped Graphene](#)”, and “[From Point to Line Defects in Two-Dimensional Transition Metal Dichalcogenides: Insights from Transmission Electron Microscopy and First-Principles Calculations](#)” respectively). The paper presented in Chapter “[Morphing Graphene-Based Systems for Applications: Perspectives from Simulations](#)” links the first part of the volume with the second and addresses the issue of tailoring the modelling approaches in the simulations of graphene-based systems towards a more realistic comparison with experiments at coarse scales. In Chapter “[Perfecting the Growth and Transfer of Large Single-Crystal CVD Graphene: A Platform Material for Optoelectronic Applications](#)”, an up-to-date survey of the real world of CVD

growth of graphene is presented. This chapter paves the way for the rest of the volume which is more focused on applications of graphene and other 2D systems: electronics (in Chapter “[Advances in the Fabrication of Large-Area Back-Gated Graphene Field-Effect Transistors on Plastics: Platform for Flexible Electronics and Sensing](#)”), growth of other 2D “enes” (Chapter “[Silicene in the Flatland](#)”), energy storage (Chapter “[Decorated and Modified Graphenes as Electrodes in Na and Li-Ion Batteries](#)”), gas sensing (Chapter “[Chemically Exfoliated Layered Materials for Practical Gas Sensing Applications](#)”), functional materials generation (Chapter “[Solutions of Reduced Carbon Allotropes and Their Utilization for Functional Material Generation](#)”), fabrication of foams (Chapter “[Synthesis of High-Density Graphene Foams using Nanoparticle Templates](#)”) and novel advanced functional materials based on proteins and graphene (Chapter “[Protein-Based Nanostructures and Their Self-assembly with Graphene Oxide](#)”), to finish with a survey of nanobio applications of graphene biocomposites (Chapter “[Graphene Bionocomposites](#)”).

In summary, although completeness is by far too an ambitious goal in a single-volume survey of the exploding multidisciplinary research on the world of 2D materials, this book is however a *nice journey through 2D materials from fundamentals and applications*.

As Editors, we are very grateful to all the members of the International Advisory Committee, as well as other anonymous referees, for their valuable contribution to the review procedure. Moreover, as Chairs, we would like to thank all the members of the International Scientific Committee and of the Local Committee of GraphITA for their fundamental contribution and support for the success of the workshop. Finally, we are very grateful to Mayra Castro, and Petra Jantzen of Springer Office for their helpful assistance during the preparation of this special volume.

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