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Ph.D., University of Texas at Dallas
(2012)

Research Summary:

My Ph.D. research focused on engineering and chemistry of 2D graphene-based carbon nanomaterials to examine the chemical/physical interactions at the surfaces and interfaces and enable their applications in optoelectronic devices, energy storage devices (ultracapacitors, supercapacitors), and catalysis. In particular, my research interests involved chemistry of graphene; i.e. synthesis, characterization, thermal annealing of graphene oxide, and analysis of oxidized carbon nanotubes (graphene nanoribbons) using *in-situ* characterization, mainly infrared transmission or reflection spectroscopy, jointly with polarization studies. Unravelling oxygen interactions during thermal annealing processes in reduced graphene oxide coupled with DFT simulated infrared frequencies and MD simulations, we could achieve a deep understanding for the role of oxygen both on the surfaces and at the edges of synthesized graphene sheets and graphene-based nanoribbons under ambient conditions (vacuum, nitrogen and argon gas, etc.) in comparison to moisture effects. I currently gain my motivation and passion in science to continue and pursue my research in the areas of in-situ/operando spectroscopy, surface and interface engineering (chemical functionalization/intercalation), 2D/3D novel graphene derivatives (nanocrystals, nanohybrids, etc.), and their use in energy storage/conversion devices, primarily for solar cells (*i.e.* organic photovoltaics).

Selected Recent Publications:

- Acik, M., Lee, G., Mattevi, C., Chhowalla, M., Cho, K., Chabal, Y.J. "Unusual infrared absorption mechanism in thermally reduced graphene oxide" Nat. Mater., 9, 840-845 (2010).
- Acik, M., Lee, G., Mattevi, C., Pirkle, A., Wallace, R.M., Chhowalla, M., Cho, K., Chabal, Y.J. "The role of oxygen during thermal reduction of graphene oxide studied by infrared absorption spectroscopy" J. Phys. Chem. C, 115, 19761–19781 (2011).
- Acik, M., Mattevi, C., Gong, C., Lee, G., Cho, K., Chhowalla, M., Chabal, Y.J. "The role of intercalated water in multilayered graphene oxide" ACS Nano, 4, 5861–5868 (2010).
- Su, C., Acik, M., Takai, K., Lu, J., Hao, S., Zheng, Y., Wu, P., Bao, Q., Enoki, T., Chabal, Y. J., Loh. K.P. "Probing the catalytic activity of porous graphene oxide and the origin of this behaviour" Nat. Commun., 3, 1298 (2012).
- Bagri, A., Mattevi, C., Acik, M., Chabal, Y.J., Chhowalla, M., Shenoy, V. "Structural evolution during the reduction of chemically derived graphene oxide" Nat. Chem., 2, 581-587 (2010).
- Kim, S., Zhou, S., Hu, Y., Acik, M., Chabal, Y. J., Berger, C., de Heer, W., Bongiorno, A., Riedo, E. "Room temperature metastability of multilayer graphene oxide films" Nat. Mater., 11, 544-549 (2012).