Research Activities at MackGraphe

E.A. Thoroh de Souza
MackGraphe – Graphene and Nanomaterials Reseach Center
Mackenzie Presbyterian University, Sao Paulo- Brazil
thoroh@mackenzie.br

MackGraphe initiated its activities in 2013 and has a start-up fund of approximately US$ 20,000,000.00, which includes the construction of a new building. The aim is to carry out graphene and nanomaterials synthesis (via both CVD growth and exfoliation), characterization, and device development, with special attention to photonic devices. The mission of MackGraphe is to investigate properties of graphene and nanomaterials with an applied engineering thinking. We expect strong collaboration with industries to develop technologies that meet the society needs. We are focused on seeking novelty in science and in technology innovation; recruiting the best and brightest students and researchers; and creating an environment to encourage long-term thinking.

We present some results we obtained in modeling of current flow in biased bilayer graphene [1], a new method of direct dry transfer of chemical vapor deposition graphene to polymeric substrates [2], and application of nanomaterials in the generation of ultrashort pulses [3].

Fig 1. Perspective of the new building under construction which includes a clean room class 1000.

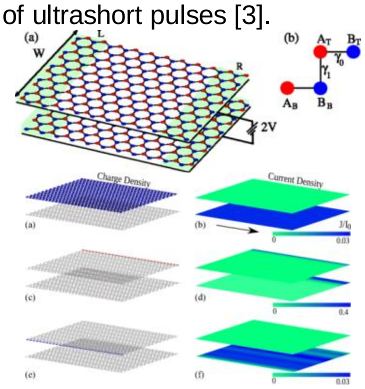

Fig 2. (a) Schematic representation of a BLG nanoribbon, with zigzag edges and width W, between left (L) and right (R) semi-infinite contacts. Spatial distribution of charge densities (left) and current densities (right) over each layer of the BLG [1].

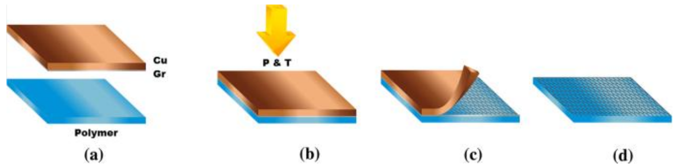

Fig. 3. Schematic of the transfer method and sample after transfer. (a–d) Schematic: (a) graphene/metal and polymer film before transfer. (b) Polymer application step to form the metal/graphene/polymer stack. (c) Peeling of the metal step. (d) Final graphene/polymer stack. [2].

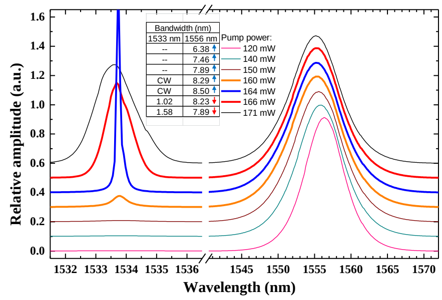

Fig. 4. Output spectrum from a dual-wavelength EDFL based on CNT [3].

References:

1. C. J. Páez, D. A. Bahamon, and Ana L. C. Pereira, Current flow in biased bilayer graphene: Role of sublattices", Phys. Rev. B 90, 125426 – Published 17 September 2014.
2. Fechine, Guilhermino J. M.; Martin-Fernandez, Iñigo; Yiapanis, George; et al, "Direct dry transfer of chemical vapor deposition graphene to polymeric substrates", Carbon Volume: 83, Pages: 224-231 Published: 2015
3. H. G. Rosa, D. Steinberg, and E. A. Thoroh de Souza, "Explaining simultaneous dual-band carbon nanotube mode-locking Erbium-doped fiber laser by net gain cross section variation", Optics Express, Vol. 22, Issue 23, pp. 28711-28718 (2014).