

Multifunctional materials for electronics and photonicsFederico Rosei¹*Canada Research Chair in Nanostructured Organic and Inorganic Materials*

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The bottom-up approach is considered a potential alternative for low cost manufacturing of nanostructured materials [1]. It is based on the concept of self-assembly of nanostructures on a substrate, and is emerging as an alternative paradigm for traditional top down fabrication used in the semiconductor industry. We demonstrate various strategies to control nanostructure assembly (both organic and inorganic) at the nanoscale. Depending on the specific material system under investigation, we developed various approaches, which include, in particular: (i) control of size and luminescence properties of semiconductor nanostructures, synthesized by reactive laser ablation [2]; (ii) we developed new experimental tools and comparison with simulations are presented to gain atomic scale insight into the surface processes that govern nucleation, growth and assembly [3-7]; (iii) we devised new strategies for synthesizing multifunctional nanoscale materials to be used for electronics and photovoltaics [8-22].

References

- [1] F. Rosei, *J. Phys. Cond. Matt.* **16**, S1373 (2004); [2] D. Riabinina, C. Durand, J. Margot, M. Chaker, G.A. Botton, F. Rosei, *Phys. Rev. B* **74**, 075334 (2006); [3] K. Dunn, J. Derr, T. Johnston, M. Chaker, F. Rosei, *Phys. Rev. B* **80**, 035330 (2009); [4] F. Ratto, A. Locatelli, S. Fontana, S. Kharrazi, S. Ashtaputre, S.K. Kulkarni, S. Heun, F. Rosei, *Small* **2**, 401 (2006); [5] F. Ratto, A. Locatelli, S. Fontana, S. Kharrazi, S. Ashtaputre, S.K. Kulkarni, S. Heun, F. Rosei, *Phys. Rev. Lett.* **96**, 096193 (2006); [6] F. Ratto, S. Heun, O. Moutanabbir, F. Rosei, *Nanotechnology* **19**, 265703 (2008); [7] F. Ratto, T.W. Johnston, S. Heun, F. Rosei, *Surf. Sci.*, **602**, 249 (2008); [8] F. Ratto, F. Rosei, *Mater. Sci. Eng. R* **70**, 243 (2010); [9] O. Moutanabbir, F. Ratto, S. Heun, K. Scheerschmidt, A. Locatelli, F. Rosei, *Phys. Rev. B* **85**, 201416 (2012); [10] C. Yan et al., *Adv. Mater.* **22**, 1741 (2010); [11] C. Yan et al., *J. Am. Chem. Soc.* **132**, 8868 (2010); [12] R. Nechache et al., *Adv. Mater.* **23**, 1724–1729 (2011); [13] R. Nechache, C. Harnagea, S. Licoccia, E. Traversa, A. Ruediger, A. Pignolet, F. Rosei, *Appl. Phys. Lett.* **98**, 202902 (2011); [14] B. Aïssa, R. Nechache, D. Therriault, F. Rosei, M. Nedil, *Appl. Phys. Lett.* **99**, 183505 (2011); [15] G. Chen et al., D. Ma, *Chem. Commun.* **47**, 6308 (2011); [16] G. Chen, S. Desinan, R. Rosei, F. Rosei, D. Ma, *Chem. Comm.* **48**, 8009–8011 (2012); [17] G. Chen, F. Rosei, D. Ma, *Adv. Func. Mater.* **22**, 3914–3920 (2012).

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