



Università degli studi di Firenze  
Dipartimento di Fisica e Astronomia

# PhD Di<sup>e</sup>SSERTATION

Department of Physics and Astronomy (Aula Magna)  
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## **Growth and Characterization of Organic Nanocrystals for Nanophotonic Applications**

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Dibenzoterrylene (DBT) molecules embedded in Anthracene (Ac) crystals combines a bright and stable emission in the near-infrared, both at room and low temperature, with a narrow lifetime-limited emission ( $\sim 40$  MHz) around 785 nm at cryogenic temperature [1]. To date, DBT:Ac system has been successfully integrated in nanophotonics layered structures thanks to the 50 nm-thickness of Ac spin-coated crystals, covering several hundreds  $\mu\text{m}^2$  of the substrate [2]. However, to fully exploit this molecule-based solid state system as a single photon source to e.g. deliver photons into a nearby waveguide, precise positioning method and/or controllable size of the emitter is indeed desirable.

In this seminar I will present a novel technique to fabricate DBT-doped anthracene crystals with average size of few-hundreds nanometers and controllable DBT concentration. Preliminary investigations demonstrate that the optical properties of the bulky DBT:Ac system at room temperature are preserved.

[1] J. B. Trebbia et al., *Opt. Express*, 23986–23991 (2009)

[2] C. Toninelli et al., *Opt. Express* 18, 6577–6582 (2010)