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# Synthesis and properties of graphene quantum dots and nanomeshes

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## Abstract

We chose to adopt a bottom-up approach for the synthesis and the study of the optical and electronic properties graphene quantum dots (GQDs) and graphene nanomeshes (GNMs) (regular patterns of holes in 2D graphene sheets). The interest of these graphene materials is multiple: the size, morphology and composition of GQDs will influence their electronic properties (as for inorganic QDs). For example, graphene quantum dots exhibiting luminescence in the red or near-infrared region (at wavelength in which living tissues are transparent) may find application in biology. Similarly, by controlling the structure, one can think about reaching  $1.5\mu\text{m}$  of emission wavelength (telecom wavelength). The 0D electronic structures of these objects may lead to the emission of single photons at these wavelengths. In this view, it is of high interest to investigate the potentialities of graphene quantum dots. The bottom-up synthesis of 2D networks of graphene containing holes or doping element has not been accomplished so far. In our approach we want to combine theory and experiment to reach the best compromise between the size of holes and their distribution in 2D nanomeshes.

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