Bottom-Up Approach to Graphene Nanostructures

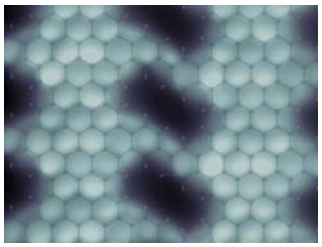
Tailored Synthesis of Graphene Nanoribbons and Nanographenes

Summary

One of the graphene science´s challenges is the efficient preparation of graphene nanomaterials with well-defined size, shape and quality.

Organic chemistry methodologies in solution became a very useful approach for this purpose.

- **Building blocks**: substituted polyaromatics as precursors for nanoribbons (GNRs), quantum dots (GQDs) or nanoporous (NPGs) graphenes.
- **Nanosized graphenes**: homogeneous nanographene materials with different sizes, peripheries and substitutions.



Uniformly arranged nanopores within a graphene monolayer: atomic precision and full control over its functionalisation.

Tunable permeability and bandgap similar to that of silicon.

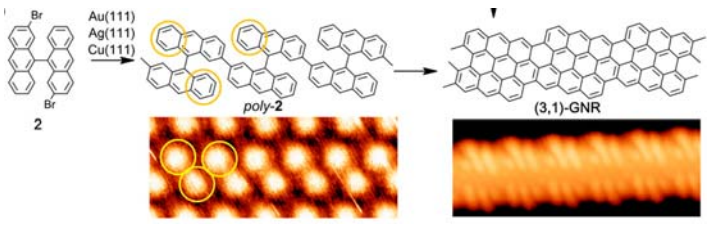
What we Offer

SUBSTITUTED POLYAROMATICS: precursor monomers for the preparation of both graphene nanoribbons (GNRs) and nanoporous graphenes (NPGs).

These designed monomers have shown to be useful for the on-surface preparation of GNRs with diverse widths and lengths:

- Bottom-up synthesis of multifunctional nanoporous graphene. *Science* **2018**, 360, 199.

- Substrate-Independent Growth of Atomically Precise Chiral Graphene Nanoribbons. *ACS Nano* **2016**, 10, 9000

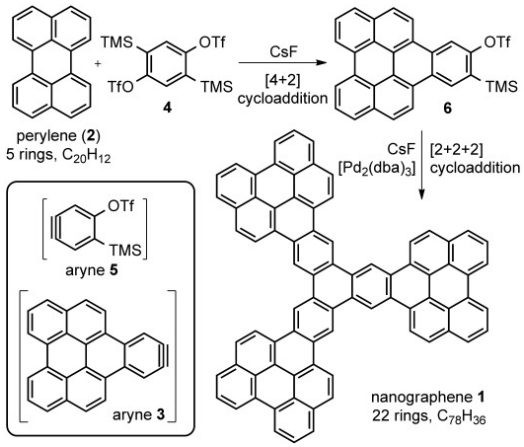


Transformation of the precursor molecule into chiral GNRs independently of the substrate.

WELL-DEFINED NANOGRAPHENES obtained by organic chemistry in solution. We can access homogeneous nanographenes with different sizes, peripheries and substitutions.

These materials can be particularly interesting for molecular optoelectronic applications.

- From Perylene to a 22-Ring Aromatic Hydrocarbon in One-Pot. *Angew. Chem. Int. Ed.* **2014**, 53, 9004.



Key Features

- Design and *à la carte* synthesis of precursors for graphene nanomaterials.
- Preparation of nanographenes by solution chemistry or on-surface synthesis.

Collaboration Objectives

To test and use our *à la carte* graphene materials:

- **Nanoporous graphene**. Membrane applications such as water desalination, pollutant treatment and gas separation. See our Tech Offer "*Holey Graphene by Lego Chemistry*".
- **Graphene molecules and nanorribons** for (opto)electronic applications, as well as molecular electronics and fabrication of OFETs, OLEDs among other devices.

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