

A new process for the synthesis of extended, 2D carbon nitrides

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The first preparation of graphene by Geim and Novoselov in 2004 sparked an ever-increasing interest in 2D materials. Indeed, along with graphene, dichalcogenides such as MoS₂ or WS₂, silicene, phosphorene, hexagonal boron nitride etc... are also being investigated all over the world, due to their fascinating physical and chemical properties. Besides, the bottom-up synthesis of 2D covalent networks by means of organic synthesis is also being receiving a growing interest. They are usually obtained by assembling small molecular building units using the rich toolbox of molecular chemistry. We describe here a new process for the synthesis of very high quality 2D materials such a C₂N, CN and C₄N₃ carbon nitrides. This wet process relies on the use of a metallic surface as both a reagent and a support for the coupling of small halogenated building blocks. The conditions of the assembly reaction are chosen so as to leave the inorganic salts by-products on the surface, to further confine the assembly reaction on the surface and increase the quality of the 2D layers. Very high quality flakes are obtained, in terms of lateral size and defect-free nature.

References

A simple and efficient process for the synthesis of 2D carbon nitrides and related materials; Cora Moreira Da Silva et al. Scientific Reports | (2023) 13:15423 | <https://doi.org/10.1038/s41598-023-39899-5>.

<https://cnrs.hal.science/hal-03874253/>

Figures

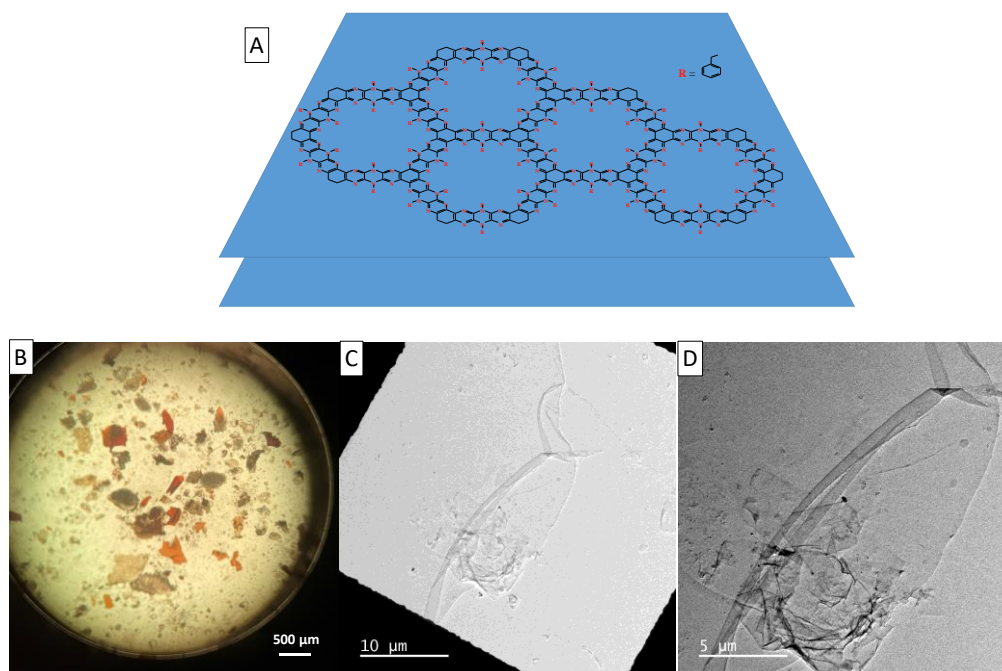


Figure 1: an example of a C₄N₃ carbon nitride obtained using our new process (A). Optical microscopy (B) and TEM observation (C and D) of C₄N₃ flakes