

High-pressure formation of 1D diamond-like nanowires from aromatics

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The number and the applications of pure or hybrid carbon nanomaterials impressively grew in the last years encompassing many different research areas like energy storage, biomedical and environmental applications, organic solar cells, sensors and biosensors, imaging, material science and many others. These applications mainly regards the use of pure or composite materials based on graphene, nanotubes and nanodiamonds. Among pure carbon nanomaterials, saturated carbon nanothreads are the last discovered filling the gap concerning the existence of fully sp^3 carbon 1D polymeric chains. These materials are expected to be characterized by extraordinary mechanical properties combining a stiffness only slightly less than diamond, with flexibility, resilience and excellent tensile strength. Saturated carbon nanothreads were predicted well in advance with respect to the first reported synthesis realized by compressing benzene in a diamond anvil cell (DAC). After this first achievement, the number of syntheses and the comprehension of reaction mechanisms impressively grew thus putting the basis for potential technological applications.

In this talk I will describe the present knowledge we have of this new material with particular attention to the knowledge gained by different studies on the mechanism of their formation. Taking advantage of the successful reaction performed starting from different aromatics like pyridine, aniline, stilbene and others, I will try to describe the state of art of the research and the possible future directions.