Tailoring the low-dimensional carbon allotropes vibrational signature and functionality at the ion-assisted pulse-plasma growing

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The low-dimensional carbon allotropes serve as building blocks for macroscopic assembly to emerging applications. Carbyne can be considered as a holy grail of carbon allotropes. The aim of this research is tracking the pathways to unlocking new threshold parameter relationships during the ion-assisted low-temperature plasma growing the 2D-ordered linear-chained carbon (2D LCC), that will be generalized and incorporated into the deep materials informatics-based tool-kit—the data-driven carbon nanomaterials genome approach. Structural self-organizing and pattern formation are universal and key phenomena observed during growth and heteroatom-doping the 2D LCC representing a multi-cavity nano-matrix containing vacant functional nanocavities, available for heteroatom-doping. The vibrational and electromagnetic holograms with specified frequency are capable of providing spatial marking of the structure of the 2D LCC growing. We propose the innovative concept, connected with application of the universal Cymatics phenomena during the predictive growth of the 2D LCC. Fine tuning the vibration signature, functionality and nano-architecture of the 2D LCC can be proviuded by using the surface acoustic wave technology. Research of the various factors influencing the growing process opens possibilities using new universal relationships in the multifactorial computational models, which will expand the predictive capabilities of the genome approach. The reported study was funded by RFBR and TUBITAK according to the research project No. 20-58-46014.