Unlocking of extra energy from the nano-energetic materials by fine-tuning the low-dimensional nanocarbon transition interfaces

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We developed a game-changing approach for predictive unlocking of extra energy from the nano-energetic materials (nEMs) through fine-tuning vibrational interactions and energy exchange within the transition domains of nanocomponents. For predictive excitation and adjustment of the nano-interface and synergistic effects of collective atomic vibrations, we propose incorporation into the transition domains of nEMs the 2D-ordered linear-chain carbon-based nano-enhanced interfaces through the multistage technological chain. This chain includes conversion of all components into the nanoscale, the ion-assisted pulse-plasma-driven functionalization and assembling of various carbon-based nanocomponents and catalytic nano-additives with nano-enhanced interfaces, the resonant acoustic mixing of all nanocomponents and growing the high-end nEMs elements by selective high-precision additive manufacturing. Manipulation by nanoarchitecture and functionality of the 2D-ordered linear-chain carbon-based nano-enhanced interfaces as well as their synergy effects provided through using combination of a set of techniques: by energy-driven initiation of the allotropic phase transformations, by using surface acoustic waves-assisted micro/nano-manipulation during the ion-assisted pulse-plasma functionalizing, by heteroatom doping, by initiating the directed self-assembly through application external electromagnetic fields as well as by using the data-driven nanoscale manufacturing approach.The reported study was funded by RFBR (RCSI) and TUBITAK according to the research project No. 20-58-46014.