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## *Creation of nanomaterials by extreme pressure-temperature conditions*

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Nanomaterials in the form of zero-, one- and two-dimensional nanostructures make a high-impact background for both science and technology. At the same time, the synthesis of bulk nanostructured materials remains the least-explored but challenging domain that allows combining the desired physical, chemical and mechanical properties and gives rise to nanoelectronics, nanomechanics, band-gap engineering, etc. The common methods of soft chemistry allow obtaining nanoparticles whose direct sintering unavoidably leads to the grain growth and lost of nanostructure. The extreme pressure is a parameter of choice to suppress the self-diffusion responsible for high-temperature recrystallization. The bulk nanostructured materials shows the superior fracture toughness and extremely high hardness as compared to corresponding microcrystalline bulks. The remarkable changes in physical and mechanical properties, however, do not affect the original thermal and chemical stability of the phase(s). All this opens unique opportunities for high-temperature superabrasive and electronic applications of such materials. Finally, the extreme pressure-temperature conditions are powerful and promising tool for grain-size control during direct solid-state phase transformations. The simultaneous variation of pressure and temperature makes possible to combine different nucleation, growth and aggregation regimes with high flexibility, and, therefore, to go deep into nanoscale engineering.

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