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The book consists of abstracts of plenary lectures, oral reports and posters presented at the XXXIV International Conference on Interaction of Intense Energy Fluxes with Matter (1–6 March 2019, Elbrus, Kabardino-Balkaria, Russia). The presentations deal with the contemporary investigations in the field of physics of extreme states of matter. The conference topics are as follows: interaction of intense laser, x-ray and microwave radiation, powerful ion and electron beams with matter; techniques of intense energy fluxes generation; experimental methods of diagnostics of ultrafast processes; shock waves, detonation and combustion physics; equations of state and constitutive equations for matter at high pressures and temperatures; methods of mathematical modeling in physics of extreme states of matter; high-energy astrophysics; low-temperature plasma physics; physical issues of power engineering and technology aspects.

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Influence of supercooling on morphology of crystalline nuclei forming in metallic melt

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The control of crystallization of metallic glasses and the production of nanocrystallites with desired structural and morphological properties have a great importance for contemporary industries [1, 2]. In the present study the crystallization of model metallic melt at different levels of supercooling is considered by atomistic simulation method [3]. Structure analysis and quantitative evaluation of morphological characteristics of crystalline nuclei are performed for the system at low and deep supercooling levels. Theoretical model is proposed to reproduce the correspondence between a number of particles of crystalline nucleus and its average radius. We found that the evaluated size dependencies of nucleus radius, the radius of nucleus bulk part and the thickness of nucleus surface layer can differ significantly at different stages of the system crystallization. Namely, ramified structures are formed at deep and moderate supercooling levels. The attachment process of particles to the nucleus surface layer occurs unevenly that is reason why nuclei take a ramified shape. At low supercooling levels, a uniform attachment of particles to the surface layer leads to rapid increase of the radius of the nucleus bulk part. Therefore, at low supercooling the nuclei have relatively rounded or smoothed shape. The present results make a significant contribution to understanding of mechanisms of phase transformation in supercooled liquid and glassy systems. The work was supported by the Kazan Federal University and the Russian Foundation for Basic Research, projects No.18-02-00407 and 18-32-00021.

- [1] Kelton K and Greer A 2010 *Nucleation in Condensed Matter: Application in Materials and Biology* (Amsterdam: Elsevier)
- [2] Jaiswal A, Egami T and Zhang Y 2015 *Phys. Rev. B* **91** 134204
- [3] Galimzyanov B, Yarullin D and Mokshin A 2019 *JETP Lett.* **107** 629–634