

Fractal concept in materials science

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Last years, Ukrainian and Russian scientists are interested in the fractal analysis methods making it possible to describe structures formed, for example, in condensed media when non-equilibrium physico-chemical processes are realized. This article proposes a review of such works with their differentiation with respect to the methods using fractal concept. This concept is of specific methodological interest and can be used to solve the material research problems.

В последние годы внимание отечественных и российских исследователей обращено к методам фрактального анализа, позволяющего адекватно описывать структуры, формирующиеся, в частности, в конденсированных средах при реализации неравновесных физико-химических процессов. Предлагаемая статья содержит обзор таких работ с подразделением их по способу использования подходов фрактальной концепции, что представляет методологический интерес и может быть использовано для решения задач материаловедения.

Author had occasions to tell the use of fractal concept in materials science in front of several honorable scientific audiences, and that concept was accepted everywhere as a kind of exotica. The present review has been written with the aim to illustrate the wide spreading and good promise of the fractal concept just for solving of materials science problems. The article is restricted intentionally to the works done during the few last years only by scientists of our country (Institute for Materials Science Problems, NASU; Institute for Metal Physics, NASU; Institute for Surface Chemistry, NASU; Odessa Polytechnical University; Laboratory of Synergetics, Vinnitsa; Institute for Geotechnical Mechanics, NASU) as well as Russian ones (Institute for Physics, Siberian Division, RAS; Institute for Physics and Engineering, RAS, St.-Petersburg; Siberian Institute for Physics and Engineering; Institute of Crystallography, Moscow; Physico-Chemical Institute, Moscow; Nizhni Novgorod University; Voronezh Technical University). We intend to show in that way that more than "just two lads more" do so

and that such works do not performed by hedonists from across the ocean.

1. To the problem history

Nobel prize winner I.R.Prigozhin noted that the principal drawback of modern science is the fragmentary character of the scientific knowledge that does not allow to obtain an integrated scientific picture of the world [1]. The differentiation of the science is due to its pragmatic orientation, the human desire for drawing a practical good and material benefit from each scientific result as soon as possible. However, it is just "refined" ideas developed only from considerations of symmetry and mathematical form that often turned out to be of principal importance in the science. Greeks studied properties of ellipse one thousand years before Kepler used their idea to determine the planetary trajectories. The mathematical base of the relativistic theory, tensor calculus, was developed fifty years before Einstein has found a physical application therefor.