THE APPLICATION OF THE MULTIFRACTAL THEORY WITHIN QUANTUM CALCULUS

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The application of the fractal conception increasingly common appears in modern science. Fractal conception is based on characteristics of fractal sets. It is known that fractals are scale invariant sets, so to describe the multifractal the quantum calculus should be used. To describe the multifractal one can use an approach, where the deformation is applied to the multifractal parameter to vary it by means of finite dilation instead of infinitesimal shift. Moreover, it can be shown that related description can be used for the generalization of the partial function, the averages of random variables on the basis of deformed expansion and the mass exponent. Following calculus can be used in the description of multifractal in mathematical physics, solid state physics and econophysics. In macrostructure of condensates which have been obtained as result of sputtering, it is obvious that porous condensates type has apparent fractal structure. The second example of the application for the multifractal theory within quantum calculus exploits the dependencies of the time series of the currency exchange. This restriction makes possible to visualize a difference between fractal characteristics of the time series intervals. Comparing the data that had been taken before and after the financial crisis it is possible to make a conclusion that effects of this process diffracted on the fractal dimension coefficient of the lowest order and has no influence on the Tsallis entropy coefficient of the first order.

In the generalization of the multifractal theory the following characteristics have been used: the mass exponent, self-similarity coefficients, partition function. Two examples of multifractal sets in solid state physics and econophysics were shown. Mentioned examples demonstrate the areas of application of the generalized multifractal characteristics and the prospects of multifractal usage.

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1. A. Olemskoi, et al., *EPL* **89**, 50007 (2010).