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**MSC:**

35A15 Variational methods applied to PDEs  
35A08 Fundamental solutions to PDEs  
35R02 PDEs on graphs and networks (ramified or polygonal spaces)  
35R11 Fractional partial differential equations  
28A80 Fractals

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semi-inverse method; Euler-Lagrange equation; damping; two-scale fractal calculus

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**References:**

- [1] Abdusalam, H. A. and Abdusalam, H. A., Exact analytic solution of the simplified telegraph model of propagation and dissipation of excitation fronts, *Int. J. Theor. Phys.*43(4) (2004) 1161-1167. · [Zbl 1175.92010](#)
- [2] Ye, J., Hu, B. S., Jin, Y. et al., Interface engineering integrates fractal-tree structured nitrogen-doped graphene/carbon nanotubes for supercapacitors, *Electrochim. Acta*349 (2020) 136372.
- [3] Li, X. X., Tian, D., He, C. H. et al., A fractal modification of the surface coverage model for an electrochemical arsenic sensor, *Electrochim. Acta*296 (2019) 491-493.
- [4] Kumar, A., Bhardwaj, A. and Dubey, S., A local meshless method to approximate the time-fractional telegraph equation, *Eng. Comput.* (2020), <https://doi.org/10.1007/s00366-020-01006-x>.
- [5] Sweilam, N. H., Nagy, A. M. and El-Sayed, A. A., Solving time-fractional order telegraph equation via Sinc-Legendre collocation method, *Mediterr. J. Math.*13(6) (2016) 5119-5133. · [Zbl 1349.35410](#)
- [6] Wang, K. L., Yao, S. W., Liu, Y. P. et al., A fractal variational principle for the Telegraph equation with fractal derivatives, *Fractals*28(4) (2020) 2050058.
- [7] Borodich, F. M., Fractals and fractal scaling in fracture mechanics, *Int. J. Fract.*95 (1999) 239-259.
- [8] Yavari, A., Sarkani, S. and Moyer, E. T., The mechanics of self-similar and self-affine fractal cracks, *Int. J. Fract.*114(1) (2002) 1-27.
- [9] Tanaka, M., The fractal dimension of grain-boundary fracture in high-temperature creep of heat-resistant alloys, *J. Mater. Sci.*28(21) (1993) 5753-5758.
- [10] Miao, T. J., Cheng, S. J., Chen, A. M. et al., Seepage properties of rock fractures with power law length distribution, *Fractals*27(4) (2019) 1950057.
- [11] Pande, C. S., Richards, L. R. and Smith, S., Fractal characteristics of fractured surfaces, *J. Mater. Sci. Lett.*6(3) (1987) 295-297.
- [12] Bona, A. D., Hill, T. J. and Mecholsky, J. J., The effect of contour angle on fractal dimension measurements for brittle materials, *J. Mater. Sci.*36(11) (2001) 2645-2650.
- [13] Lisovskii, F. V., Lukashenko, L. I. and Mansvetova, E. G., Thermodynamically stable fractal-like domain structures in magnetic films, *JETP Lett.*79(7) (2004) 352-354.
- [14] McQueen, P. G., Physics and fractal structures, *J. Stat. Phys.*86(5-6) (1997) 1397-1398.
- [15] Yang, S. S., Fu, H. H. and Yu, B. M., Fractal analysis of flow resistance in tree-like branching networks with roughened microchannels, *Fractals*25(1) (2017) 1750008.
- [16] Wu, Y. K. and Liu, Y., Fractal-like multiple jets in electrospinning process, *Therm. Sci.*24(4) (2020) 2499-2505.
- [17] Grassberger, P., On the Hausdorff dimension of fractal attractors, *J. Stat. Phys.*26(1) (1981) 173-179.
- [18] Sidletskii, V. A. and Kolupaev, B. B., Application of the fractal approach to determination of the poisson coefficient of polymeric systems, *J. Eng. Phys. Thermophys.*76 (2003) 937-941.
- [19] Altaiski, M. V. and Sidharth, B. G., Quantization of fractal systems: One-particle excitation states, *Int. J. Theor. Phys.*34(12) (1995) 2343-2351. · [Zbl 0843.58055](#)
- [20] Stanley, H. E., Application of fractal concepts to polymer statistics and to anomalous transport in randomly porous media, *J. Stat. Phys.*36(5-6) (1984) 843-860.

- [21] Silva, L. R. D., Fractal dimension at the phase transition of inhomogeneous cellular automata, *J. Stat. Phys.*53(3-4) (1988) 985-990.
- [22] Leonenko, N. and Vaz, J. Jr., Spectral analysis of fractional hyperbolic diffusion equations with random data, *J. Stat. Phys.*179(1) (2020) 155-175. · [Zbl 1436.35007](#)
- [23] Pande, C. S., Richards, L. R. and Smith, S., Fractal characteristics of fractured surfaces, *J. Mater. Sci. Lett.*6(3) (1987) 295-297.
- [24] Bona, A. D., Hill, T. J. and Mecholsky, J. J., The effect of contour angle on fractal dimension measurements for brittle materials, *J. Mater. Sci.*36(11) (2001) 2645-2650.
- [25] Saouma, V. E. and Fava, G., On fractals and size effects, *Int. J. Fract.*137(1-4) (2006) 231-249. · [Zbl 1197.74176](#)
- [26] Polyakov, V. V. and Kucheryavskii, S. V., The fractal analysis of a porous material structure, *Tech. Phys. Lett.*27(7) (2001) 592-593.
- [27] Miao, T. J., Chen, A. M., Zhang, L. W. et al., A novel fractal model for permeability of damaged tree-like branching networks, *Int. J. Heat Mass Transfer*127(A) (2018) 278-285.
- [28] Miao, T. J., Long, Z. C., Chen, A. M. et al., Analysis of permeabilities for slug flow in fractal porous media, *Int. Commun. Heat Mass Transfer*88 (2017) 194-202.
- [29] Miao, T. J., Cheng, S. J., Chen, A. M. et al., Analysis of axial thermal conductivity of dual-porosity fractal porous media with random fractures, *Int. J. Heat Mass Transfer*102 (2016) 884-890.
- [30] Xu, L. Y., Li, Y., Li, X. X. et al., Detection of cigarette smoke using a fiber membrane film with carbon nanoparticles and a fractal current law, *Therm. Sci.*24(4) (2020) 2469-2474.
- [31] Yang, Z. P., Zhang, L., Dou, F. et al., A fractal model for pressure drop through a cigarette filter, *Therm. Sci.*24(4) (2020) 2653-2659.
- [32] Yang, Z. P., Dou, F., Yu, T. et al., On the cross-section of shaped fibers in the dry spinning process: Physical explanation by the geometric potential theory, *Results Phys.*14 (2019) 102347.
- [33] El-Nabulsi, R. A., Emergence of quasiperiodic quantum wave functions in Hausdorff dimensional crystals and improved intrinsic carrier concentrations, *J. Phys. Chem. Solids*127 (2019) 224-230.
- [34] El-Nabulsi, R. A., Geostrophic flow and wind-driven ocean currents depending on the spatial dimensionality of the medium, *Pure Appl. Geophys.*176(6) (2019) 2739-2750.
- [35] El-Nabulsi, R. A., Dirac equation with position-dependent mass and coulomb-like field in hausdorff dimension, *Few-Body Syst.*61(1) (2020) 10.
- [36] El-Nabulsi, R. A., Spectrum of Schrödinger Hamiltonian operator with singular inverted complex and Kratzer's molecular potentials in fractional dimensions, *Eur. Phys. J. Plus*133(7) (2018) 277.
- [37] El-Nabulsi, R. A., Modifications at large distances from fractional and fractal arguments, *Fractals*18(2) (2010) 185-190. · [Zbl 1196.28014](#)
- [38] El-Nabulsi, R. A., Path integral formulation of fractionally perturbed Lagrangian oscillators on fractal, *J. Stat. Phys.*172(6) (2018) 1617-1640. · [Zbl 1401.83005](#)
- [39] Wang, Y., An, J. and Wang, X., A variational formulation for anisotropic wave travelling in a porous medium, *Fractals*27(4) (2019) 1950047.
- [40] Wang, K. L. and He, C. H., A remark on Wang's fractal variational principle, *Fractals*27(8) (2019) 1950134. · [Zbl 1434.35267](#)
- [41] Shen, Y. and He, J. H., Variational principle for a generalized KdV equation in a fractal space, *Fractals*28(4) (2020) 2050069. · [Zbl 1441.35009](#)
- [42] He, J. H., A fractal variational theory for one-dimensional compressible flow in a microgravity space, *Fractals*28(2) (2020) 2050024.
- [43] He, J. H. and Ain, Q. T., New promises and future challenges of fractal calculus: From two-scale Thermodynamics to fractal variational principle, *Therm. Sci.*24(2A) (2020) 659-681.
- [44] He, J. H., Variational principle for the generalized KdV-Burgers equation with fractal derivatives for shallow water waves, *J. Appl. Comput. Mech.*6(4) (2020) 735-740, <https://doi.org/10.22055/JACM.2019.14813>.
- [45] He, J. H., Fractal calculus and its geometrical explanation, *Results Phys.*10 (2018) 272-276.
- [46] He, J. H. and Ji, F. Y., Two-scale mathematics and fractional calculus for thermodynamics, *Therm. Sci.*23(4) (2019) 2131-2133.
- [47] Ain, Q. T. and He, J. H., On two-scale dimension and its applications, *Therm. Sci.*23(3B) (2019) 1707-1712.
- [48] Ji, F.-Y., He, C.-H., Zhang, J.-J. et al., A fractal Boussinesq equation for nonlinear transverse vibration of a nanofiber-reinforced concrete pillar, *Appl. Math. Model.*82 (2020) 437-448. · [Zbl 1481.74266](#)
- [49] He, J. H., A short review on analytical methods for to a fully fourth-order nonlinear integral boundary value problem with fractal derivatives, *Int. J. Numer. Methods Heat Fluid Flow* (2020), <https://doi.org/10.1108/HFF-01-2020-0060>.
- [50] He, C. H., Shen, Y., Ji, F. Y. et al., Taylor series solution for fractal Bratu-type equation arising in electrospinning process, *Fractals*28(1) (2020) 2050011.
- [51] He, J. H., A simple approach to one-dimensional convection-diffusion equation and its fractional modification for E reaction arising in rotating disk electrodes, *J. Electroanal. Chem.*854 (2019) 113565.
- [52] Liu, H. Y., Yao, S. W., Yang, H. W. and Liu, J., A fractal rate model for adsorption kinetics at solid/solution interface, *Therm. Sci.*23(4) (2019) 2477-2480.

- [53] Wang, Y., Yao, S. W. and Yang, H. W., A fractal derivative model for snow's thermal insulation property, *Therm. Sci.*23(4) (2019) 2351-2354.
- [54] He, J. H., Generalized variational principles for buckling analysis of circular cylinders, *Acta Mech.*231 (2020) 899-906. · [Zbl 1434.74058](#)
- [55] He, J. H., Variational principle and periodic solution of the Kundu-Mukherjee-Naskar equation, *Results Phys.*17 (2020) 103031.

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