From the Guest Editors

Diffusion models, both linear and non-linear, describe important practical situations of material dynamics. Among them, the fractional diffusion equations, the classic and local ones, relevant to the anomalous diffusion, cover the broadness of their physical applications arising in heat and mass transfer through disordered media.

Fractional calculus started to be utilized successfully in many areas of science and engineering.

More recently, the definitions of the local fractional derivatives were presented to solve the non-differentiable problems in fractal time-space.

The local version of PFD defined on Cantor sets and their solutions were developed with the help of local fractional functional techniques.

This special issue titled **NONLINEAR DIFFUSION MODELS IN HEAT AND MASS TRANSFER** consists of 34 papers which are divided into 3 main parts.

The first part consists of 11 papers based on very high level results involving the fractional calculus methods and techniques. The solutions for a fractional diffusion equation with radial symmetry and integro-differential boundary conditions and the numerical analysis of time fractional three dimensional diffusion equation were presented. The extension of fragmentation process in a kinetic-diffusive-wave system was reported. Also, a new numerical technique for solving fractional sub-diffusion and reaction sub-diffusion equations with a non-linear source term was analysed.

The reconstruction of the boundary condition for the heat conduction equation of fractional order and the topic of two exact solutions of time fractional heat equations using different transforms can be seen as distinct contributions of the special issue. In addition, the solution for a system of fractional heat equations of nanofluid along a wedge, the implicit local radial basis function method for solving 2-D time fractional diffusion equations, the solutions of fractional diffusion equations by variation of parameters method were reported. The first part of the special issue ends with solving the time-fractional diffusion equation using a Lie group integrator and time-fractional free convection flow near a vertical plate with Newtonian heating and mass diffusion.

The second part consists of 10 high level manuscripts dealing with methods and techniques from the emerging fields on fractal and local fractional calculus.

A novel schedule for solving the 2-D diffusion problem in fractal heat transfer and a new iteration algorithm for solving the diffusion problem in non-differentiable heat transfer are reported.

The diffusion model of fractal heat and mass transfer in fluidized bed: a local fractional arbitrary Euler-Lagrange, a new computational method for the 1-D diffusion problem with the diffusive parameter variable in fractal media and a decomposition method for solving diffusion equations *via* local fractional time derivatives are contemporary topics reported in our special issue.

Besides, the local fractional Laplace series expansion method for diffusion equation arising in fractal heat transfer, the Adomian decomposition method for 3-D diffusion model in fractal heat transfer involving local fractional derivatives as well as the fractal analysis of polar bear hairs can be seen as interesting parts of the special issue.

Finally, LFLVIM for the 2-D diffusion equation in homogeneous materials, a new coupling schedule for series expansion method and Sumudu transform with an application to diffusion equation in fractal heat transfer and observing diffusion problems defined on cantor sets in different coordinate systems end the second part of the special issue.

The remainder of papers, **in the Third part**, debated hot topics in conventional fluid flow.

The study of the model of contaminant ions reaction and diffusion near wellbore, the entropy generation analysis of the revised Cheng-Minkowycz problem for natural convective boundary layer flow of nanofluid in a porous medium using an analytical method is reported in our special issue.

The 1-D heat conduction equation of the polar bear hair, rotating MHD flow of a generalized Burgers' fluid over an oscillating plate embedded in a porous medium, on the study of viscous fluid due to exponentially shrinking sheet in the presence of thermal radiation are topics of current interest which are part of the special issue. Also the irreversibility analysis of magneto-hydrodynamic nanofluid flow injected through a rotary disk and the experimental verification of approximate solution of the inverse Stefan problem obtained by applying the invasive weed optimization algorithm were presented. The readers can see the research topics as the experimental and numerical investigation of thermal performance of channels with staggered array-based dimples, the numerical investigation of heat transfer performance of synthetic jet impingement onto dimpled/protrusioned surface and the solution of diffusion equation with local derivative with new parameter.

The special issue ends with the work on the unsteady boundary layer flow and heat transfer of Oldroyd-B nanofluid towards a stretching sheet with variable thermal conductivity followed by a new numerical investigation of some thermo-physical properties on unsteady MHD non-Darcian flow past an impulsively started vertical surface.

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