

Weak solution to a Robin problem of anomalous diffusion equations: uniqueness and stable algorithm for the TPC system

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Abstract

A Riemann-Liouville fractional Robin boundary-value problem is proposed to describe the fast heat transfer law both within isotropic materials and through the boundary of the materials in high temperature environment. The variational formulation of the fractional model is given, and further the energy estimation of the weak solution is deduced. The uniqueness theorem of weak solution is proved. A valid finite difference scheme is developed for the fractional model and numerical experiment is implemented. Numerical results indicate that the fractional model is applicable to discover the thermal superdiffusion in the thermal protective clothing(TPC) system and numerical algorithms are effective to improve the intelligence of TPC design.

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