

Analytical solution for the time-fractional heat conduction equation in spherical coordinate system by the method of variable separation

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Abstract

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Abstract In this paper, using the fractional Fourier law, we obtain the fractional heat conduction equation with a time-fractional derivative in the spherical coordinate system. The method of variable separation is used to solve the time-fractional heat conduction equation. The Caputo fractional derivative of the order $0 < \alpha \leq 1$ is used. The solution is presented in terms of the Mittag - Leffler functions. Numerical results are illustrated graphically for various values of fractional derivative.

Keywords: Fractional Fourier law Fractional heat conduction equation Spherical coordinate system The separation of variables Mittag - Leffler function

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