World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:10, No:04, 2016

On the PTC Thermistor Model with a Hyperbolic Tangent Electrical Conductivity

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Abstract : This paper is on the one-dimensional, positive temperature coefficient (PTC) thermistor model with a hyperbolic tangent function approximation for the electrical conductivity. The method of asymptotic expansion was adopted to obtain the steady state solution and the unsteady-state response was obtained using the method of lines (MOL) which is a well-established numerical technique. The approach is to reduce the partial differential equation to a vector system of ordinary differential equations and solve numerically. Our analysis shows that the hyperbolic tangent approximation introduced is well suitable for the electrical conductivity. Numerical solutions obtained also exhibit correct physical characteristics of the thermistor and are in good agreement with the exact steady state solutions.

Keywords : electrical conductivity, hyperbolic tangent function, PTC thermistor, method of lines
Conference Title : ICAMNA 2016 : International Conference on Applied Mathematics and Numerical Analysis
Conference Location : Boston, United States
Conference Dates : April 25-26, 2016