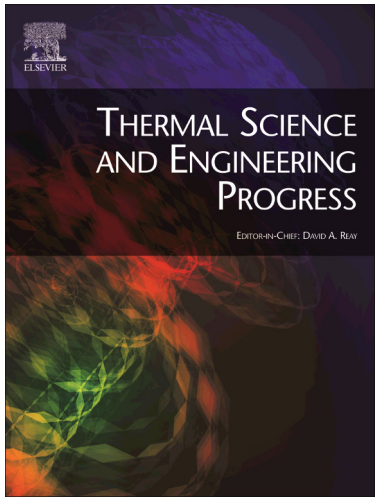

Generalized higher order Spectral Element implementation for reaction-diffusion Problems

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Generalized higher order Spectral Element implementation for reaction-diffusion Problems

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Abstract

The article presents the resolution of a reaction diffusion equations which are used basically in 1-D axial dispersion model used for chemical reactors. A lot of concerns in the fields of reaction engineering have been focused on predicting accurate solutions free from un-physical oscillations (numerical oscillations) and singularity for transport equations such as hyperbolic equations and convection diffusion equations. In the present work both the transient and steady case of reaction diffusion problem is considered to obtain a solution based on the special class of least square spectral algorithm using element approach. The variational analysis is performed to obtain the numerical solution using Newton's method for linearization technique and found that the least-squares spectral method obtains the same accuracy as obtained by Galerkin and orthogonal collocation methods. In the first phase of the work, we have tried to obtain the results by transforming the system into a linear problem imposing first-order continuity in a weak manner using Hermite's basis functions. In the second phase a comparison is made with our simulated results with the existing results considering the same basis functions.

Keywords: Convection-diffusion equation, Least-squares spectral method, Newton's method, reactor modelling.

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