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Numerical simulation for melting heat transfer and radiation effects in stagnation point flow of carbon-water nanofluid

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Abstract

This attempt addresses the simultaneous characteristics of thermal radiation and melting heat transfer effects in stagnation point flow of carbon nanotubes due to a stretching cylinder. Velocity slip phenomenon is also retained. Two types of carbon nanotubes (single and multi-walls) are homogeneously dispersed in the base fluid (water). The governing physical problem is modelled and converted into set of coupled nonlinear ODE's utilizing transformations. Resulting problems are computed numerically by fifth order Range-Kutta Fehlberg scheme. The physical characteristics of various variables on the velocity and thermal fields are examined. Numerical data for skin friction and Nusselt number have been prepared and deliberated. It is explored that velocity is increased for larger ratio of rate constants. The increasing values of melting parameter correspond to higher velocity and less temperature. Besides this the accuracy of present results is also affirmed. It is noted that the computed numerical solutions have excellent match with previous published materials in a limiting sense.

Key-words

Stagnation point; Thermal radiation; Carbon nanotubes; Melting heat transfer; Range-Kutta Fehlberg scheme.

Nomenclature			
u, v	velocity components	λ_1	latent heat of fluid
U_e	free stream velocity	c_s	heat capacity of the