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COMMENTS ON "MAGNETOHYDRODYNAMIC FLOW OF NANOFLUID OVER PERMEABLE STRETCHING SHEET WITH CONVECTIVE BOUNDARY CONDITIONS"

by

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Discussion is presented on Hayat et al. [1]'s paper, where the researchers analyzed the MHD nanofluid flow past permeable stretching sheet. This discussion illustrates that there is a discrepancy in the coefficient of thermophoretic diffusion and coefficient of Brownian diffusion units utilizing the concentration and energy equations.

Hayat *et al.* [1] carried out analysis for the MHD nanofluid flow past permeable stretching sheet. The authors employed conditions of convective type boundary to model the process of mass and heat transfer. They used appropriate transformations to reduce the nonlinear PDE to ODE. The solutions of convergent series were constructed. Hayat *et al.* [1] discussed graphical results of various parameters. The researchers examined the behaviors of thermophoretic diffusion and Brownian motion of nanoparticles. They evaluated and discussed local Sherwood and local Nusselt numbers expressions.

In their analysis, Hayat *et al.* [1] presented the equation of energy, eq. (3) in ref. [1] as:

$$u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}=\alpha\frac{\partial^2 T}{\partial y^2}+\tau\left[D_B\frac{\partial C}{\partial y}\frac{\partial T}{\partial y}+\frac{D_T}{T_\infty}\left(\frac{\partial T}{\partial y}\right)^2\right] \tag{1}$$

$$\tau=\frac{(\rho c)_p}{(\rho c)_f} \tag{2}$$

From eq. (1), every term on RHS ought have the Ks^{-1} units. Therefore, we have these units for coefficient of thermophoretic diffusion, D_T, and coefficient of Brownian diffusion, D_B:

$$[D_T]=\mathrm{m}^2\mathrm{s}^{-1}$$

$$[D_B]=\mathrm{m}^2\mathrm{s}^{-1}\mathrm{C}^{-1}$$

Also, Hayat *et al.* [1] presented the equation of concentration, eq. (4) in ref. [1], as:

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$$u\frac{\partial C}{\partial x}+v\frac{\partial C}{\partial y}=D_B\frac{\partial^2 C}{\partial y^2}+\frac{D_T}{T_\infty}\frac{\partial^2 T}{\partial y^2} \tag{3}$$

From eq. (3), every term on RHS ought have the Cs^{-1} units. Therefore, we have these units for coefficient of thermophoretic diffusion, D_T, and coefficient of Brownian diffusion, D_B:

$$[D_T] = m^2 s^{-1} C^{-1}$$

$$[D_B] = m^2 s^{-1}$$

This is not rational due to a discrepancy in the coefficient of thermophoretic diffusion, D_T, and coefficient of Brownian diffusion, D_B, units utilizing the concentration and energy equations.

Reference

[1] Hayat, T., *et al*., Magnetohydrodynamic Flow of Nanofluid over Permeable Stretching Sheet with Convective Boundary Conditions, *Thermal Science*, *20* (2016), 6, pp. 1835-1845

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