EFFECT OF ASPECT RATIO ON STEADY LIQUID METAL THROUGH THE GRAËTZ FLOW SYSTEM IN MHD

LECHEHEB[1] S., YAHI[2] F., TIGRINE[1] Z., MOKHTARI[1] F., BOUBDALLAH[1] A.
[1] Thermodynamics and Energetic Systems Lab, Faculty of Physics, USTHB, BP 32 El alia, Babezzouar Algiers, Algeria
[2]UniversityM'Hamed Bougara –Boumerdes, Algeria
E-mail: lecheheb.sabrina@gmail.com

This work dealt with the geometrical effect on the Graëtz flow system following the influence of the duct length to width ratio, aspect ratio Γ, on heat-transfer rates, pressure distribution and thermal performances as local and mean Nusselt numbers of molten metal flow through horizontal rectangular channel in the Poiseuille flow conditions subjected to uniform transversal magnetic field.

We modeled the process to establish the properties related to heat transfer involving the both thermal regions of Graëtz system in MHD. Thus, using a computational fluid dynamics procedure based on finite volume method (Fluent Code), we studied numerically the problem in order to characterize and control the viscous MHD flow according to an imposed axial temperature gradient.

As a result of the effect of aspect ratio on the liquid metal for the considered geometry. This one is connected with the sensitive parameters, namely, the Brinkman number Br, the Hartmann number Ha and the Peclet number Pe.

The advantage of such modifications will directly affect the probability distribution of the temperature field, with or without a magnetic field effect. Under these conditions, we note that an early transition regime [1] from the laminar flow to turbulence and therefore by decreasing Γ to enhance both heat transfer rates and flow mixing by pressure drop as Γ deceases.

Keywords: Graetz flow system, Thermal performance, Poiseuille flow, Aspect ratio, Nusselt number

Reference

[1] Mondal, R.N.: Effect of Aspect ratio on unsteady solutions through curved duct flow, Appl. Math. Mech. Engl, Ed., 34 (9), 1107-1122 (2013).