A numerical study has been conducted for natural convection of air in a three dimensional inclined annulus enclosure. This study wills exam the effect of fibres filler in composite material of inclined enclosure on heat transfer. Two types of optimization will be performed in terms of effective thermal conductivity: minimization and maximization of thermal conductivity. The annulus material is made of Graphite/epoxy laminated composite materials. The annulus enclosure is filled with porous media between two inclined concentric cylinders with 12 fins attached to the inner cylinder. The system is under steady state condition and constant walls temperature boundary condition. The parameters affected on the system are modified Rayleigh number (10 ?Ra*? 500) and the annulus inclination angle ? (0o, 30o, 45o, 60o and 90o). For all parameters, results showed that the average Nu number decrease with the increase of ? for high values of Ra* and increases with an increase in modified Rayleigh number but for low values of Ra*, the effect of ? on the average Nu will be low. The deviation between the average Nu for the maximization and minimization of the thermal conductivity is equal to 5. 1% for horizontal annulus ?=0o and 10% for vertical annulus ?=90o. A correlation for the average Nusselt number in terms of Ra* and ?, has been developed for the outer cold cylinder.
Effect of Angle of Rotation for Fiber Aligned in a Composite Material Wall of Inclined Enclosure on Heat Transfer

References

Index Terms

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Keywords

Natural convection  inclined annulus  laminar flow  porous media  graphite/epoxy  composite material.