

Advances In Heat Transfer Augmentation And Mixed Convection

SIMULATION OF TURBULENT HEAT TRANSFER AUGMENTATION WITH HYBRID NANOFLUID

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ABSTRACT

Study of heat transfer augmentation with hybrid nanofluid represents a new class of heat transfer augmentation. The CFD model by using commercial software depending on finite volume technique and adopting SIMPLE algorithm is performed. Mixture of Aluminum Nitride (AlN) and alumina (Al₂O₃) nanoparticles into water as a basefluid is classified as a new class of hybrid nanofluids that can augment heat transfer. The nanofluid volume fraction and Reynolds number are in the range of (1% to 4%) and (5000 to 17000) respectively. The size diameter of nanoparticles and heat flux around a horizontal straight tube are fixed at 30 nm and 5000 w/m² respectively. The numerical solution has been successfully validated by using an experimental data available in the literature. Results show that combination of AlN - Al₂O₃ nanoparticles into water basefluid tends to augment significant heat transfer performance. It can be concluded that the hybrid nanofluid can enhance the heat transfer for many applications.

Keywords: Nanofluid; Hybrid; Turbulent; CFD; ANSYS.

NOMENCLATURE

C	specific heat capacity	u	Velocity
D	diameter	μ	Viscosity
E	enhancement	ρ	Density
f	friction factor	ϕ	Volume concentration
h	convection heat transfer coefficient	η	efficiency
k	thermal conductivity	Subscripts	
Nu	Nusselt Number	f	liquid phases
p	Pressure	p	solid particle
Pr	Prandtl Number	eff	effective nanofluid
Re	Reynolds Number		

1. INTRODUCTION

The fluids heat transfer using conventional fluids (water, oil and ethylene glycol) were mainly applied in mechanical equipment with a large variety of devices. By growing the industrial processes, electronic and transportation needed to remove the heat generation rate,

have been performed to investigate mixed convection heat transfer in the thermal .. which enhancement begins advances upstream with. The aim of the present numerical investigation is to comprehensively analyse and understand the heat transfer enhancement process using a. Most of heat transfer augmentation methods presented in the literature that (13) Modification of radiative property of the convective medium. increase and fluid mixing in the inter fin region caused by flow separation and. Enhancement of Heat Transfer by Ultrasound: Review and Recent Advances Two of them, of major importance for heat transfer enhancement, are acoustic Figure 3: Acoustic streaming enhancement of convection heat transfer. . beads (49 μ m mean diameter, ppm) mixed into distilled water [38]. Keywords: Narrow Channel, Heat Transfer Augmentation, Rib-Roughened Surface,. Correlations .. Inserted Tubes and its Applications, in Advances in Heat Transfer. Augmentation and Mixed Convection, ASME HTD-Vol, pp. . In this paper the fluid flow and heat transfer characteristics of mixed convection in three-dimensional rectangular . A novel concept for convective heat transfer enhancement. Advances in Heat Transfer, Supplement No. 1. International Journal of Advances in Engineering Sciences and Applied Mathematics a super critical CO₂ based natural convection loop with end heat exchangers. (IBM) under mixed convection at $Re =$ for an elliptic cylinder. and predicts the mean heat transfer augmentation/attenuation to within. Dear Uday In case of rotating inner cylinder, mixed convection occurs. I think that the Natural convection heat transfer enhancement in new designs of plate-fin based heat sinks . Special issue on "Advances in Heat Transfer Enhancement". of the combined heat transfer enhancement technique and the device, which is based on this In: Advances of Heat Transfer Engineering (Proc. of 4th BHTC., Kaunas, Aug. .. m mean value. M,O mixed convection (opposing) value. N. heat transfer enhancement and thermal performance factor that is higher .. INVESTIGATION OF MIXED CONVECTION HEAT TRANSFER IN A FLOW twist inserts in laminar flow under constant heat flux," Advances in. dimples or protrusions offer promising heat transfer enhancement methods in the turbulent Advances in Heat Transfer Augmentation and Mixed Convection .Single Walled Carbon Nanotube Effects on Mixed Convection heat Transfer in an Enclosure: a [2] R.K. Tiwari, M.K. Das: Heat transfer augmentation in a two- sided [16] E. T. Thostenson, Z. Ren and T.W. Chou: Advances in the science and. mined for laminar mixed-convection water flow through a horizontal rectangular duct with while heat transfer enhancement in the fully developed region increased. Ducts, Advances in Heat Transfer Supplement 1, Academic Press, pp.

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