







## Greek symbols

$\alpha$	thermal diffusivity
$\vartheta$	kinematic viscosity
$\emptyset$	volume fraction
$\mu$	dynamic viscosity
$\theta$	dimensionless temperature
$\rho$	fluid density
$\beta$	thermal expansion coefficient

## NOMENCLATURE

Ec	Eckert number, $\mu_f \alpha_f k / [(\rho c_p)_f q'' L^3]$
$C_p$	specific heat at constant pressure
Gr	Grashof number
$NU_{lo}$	local Nusselt number
$NU_{ave}$	average Nusselt number
Pr	Prandtl number, $\vartheta_f / \alpha_f$
T	fluid temperature
u,v,w	velocity component in the x-direction and y- direction and z-direction
X,Y,Z	dimensionless space coordinates
U,V,W	c
K	thermal conductivity
Ra	Rayleigh Number ( $= g \beta_f q'' L^4 / k \alpha_f \vartheta_f$ )

## Subscripts

c	cold
h	hot
nf	nanofluid
f	base fluid
n	nanoparticle
in	inlet
out	outlet