Mathematical Nomenclature

Roman Letters

a	Amplitude of wave-like disturbance
A	Cross-sectional area
A	Atomic weight
b	Thickness
B_g^2	Geometric buckling
B_m^2	Material buckling
c	Speed of sound
c_p	Specific heat of the coolant
C, C_1, C_2, C_R	Constants
C^*, C^{**}	Constants
C_f	Friction coefficient
C_i	Concentration of precursor i
d	Diameter
D	Neutron diffusion coefficient
D_h	Hydraulic diameter of coolant channel
E	Neutron kinetic energy
E'	Neutron energy prior to scattering
f	Frequency
g	Acceleration due to gravity
h, h^*	Heat transfer coefficients
H	Height
H_E	Extrapolated height
Hm	Haberman-Morton number, normally $g\mu^4/\rho S^3$
j	Total volumetric flux
j_N	Volumetric flux of component N
J_j	Angle-integrated angular neutron current density vector
J_j^*	Angular neutron current density vector
k	Multiplication factor
k_∞	Multiplication factor in the absence of leakage

k	Thermal conductivity
$\mathcal{K}$	Frictional constants
l	Typical dimension of a reactor
ℓ	Typical dimension
ℓ	Mean free path
ℓ_a	Mean free path for absorption
ℓ_f	Mean free path for fission
ℓ_s	Mean free path for scattering
L	Neutron diffusion length, $(D/\Sigma_a)^{\frac{1}{2}}$
$\mathcal{L}$	Latent heat of vaporization
$\dot{m}$	Mass flow rate
m	Index denoting a core material
M	Number of different core materials denoted by $m = 1$ to M
Ma	Square root of the Martinelli parameter
n	Integer
$n(E)dE$	Number of neutrons with energies between E and $E + dE$
N	Number of neutrons or nuclei per unit volume
N_f	Number of fuel rods
$\mathcal{N}$	Number of atoms per unit volume
N^*	Site density, number per unit area
Nu	Nusselt number, hD_h/k_L
p	Pressure
p^T	Total pressure
P	Power
$\mathcal{P}$	Perimeter
$(1 - P_F)$	Fraction of fast neutrons that are absorbed in ^{238}U
$(1 - P_T)$	Fraction of thermal neutrons that are absorbed in ^{238}U
Pr	Prandtl number
$\dot{q}$	Heat flux per unit surface area
$\mathcal{Q}$	Rate of heat production per unit length of fuel rod
r	Radial coordinate
r, θ, z	Cylindrical coordinates
R	Radius of reactor or bubble
R_E	Extrapolated radius
R_R	Reflector outer radius
R_{RE}	Extrapolated reflector radius
R_P	Fuel pellet radius
R_O	Outer radius
Re	Reynolds number
s	Coordinate measured in the direction of flow
$S(x_i, t, E)$	Rate of production of neutrons of energy, E, per unit volume.
$\mathcal{S}$	Surface tension
t	Time
T	Temperature
u, U	Velocity

$\bar{u}$	Neutron velocity
u_i	Fluid velocity vector
u_N	Fluid velocity of component N
V	Volume
$\dot{V}$	Volume flow rate
x, y, z	Cartesian coordinates
x_i	Position vector
x_N	Mass fraction of component N
$\mathcal{X}$	Mass quality
z	Elevation

Greek Letters

α	Volume fraction
α_L	Thermal diffusivity of liquid
α_{mf}	Ratio of moderator volume to fuel volume
β	Fractional insertion
β	Volume quality
β	Fraction of delayed neutrons
ϵ	Fast fission factor of ^{238}U
δ	Boundary layer thickness
η	Efficiency
η	Thermal fission factor of ^{238}U
θ	Angular coordinate
κ	Bulk modulus of the liquid
κ	Wavenumber
κ_L, κ_G	Shape constants
λ	Wavelength
λ_i	Decay constant of precursor i
$(1 - \Lambda_F)$	Fraction of fast neutrons that leak out of the reactor
$(1 - \Lambda_T)$	Fraction of thermal neutrons that leak out of the reactor
ξ	Time constant
ξ_1, ξ_2	Constants
μ, ν	Dynamic and kinematic viscosity
ρ	Density
ρ	Reactivity, $(k-1)/k$
σ	Cross-section
$\sigma_a, \sigma_f, \sigma_s$	Cross-sections for absorption, fission and scattering
Σ	Macroscopic cross-section, $\mathcal{N}\sigma$
Σ_{tr}	Macroscopic transport cross-section, $1/3D$
τ	Half-life
τ_w	Wall shear stress
ϕ	Angle-integrated neutron flux

$\phi_L^2, \phi_G^2, \phi_{L0}^2$	Martinelli pressure gradient ratios
φ	Angular neutron flux
ω	Radian frequency
ω_a	Acoustic mode radian frequency
ω_m	Manometer radian frequency
Ω_j	Unit direction vector

Subscripts

On any variable, Q:

Q_o	Initial value, upstream value or reservoir value
Q_1, Q_2	Values at inlet and discharge
Q_a	Pertaining to absorption
Q_b	Bulk value
Q_c	Critical values and values at the critical point
Q_d	Detachment value
Q_e	Effective value or exit value
Q_e	Equilibrium value or value on the saturated liquid/vapor line
Q_i	Components of vector Q
Q_f	Pertaining to fission or a fuel pellet
Q_s	Pertaining to scattering
Q_w	Value at the wall
Q_A, Q_B	Pertaining to general phases or components, A and B
Q_B	Pertaining to the bubble
Q_C	Pertaining to the continuous phase or component, C
Q_C	Critical value
Q_C	Pertaining to the coolant or cladding
Q_{CI}	Pertaining to the inlet coolant
Q_{CS}	Pertaining to the inner cladding surface
Q_D	Pertaining to the disperse phase or component, D
Q_E	Equilibrium value
Q_F	Pertaining to fast neutrons
Q_{FS}	Pertaining to the fuel pellet surface
Q_G	Pertaining to the gas phase or component
Q_L	Pertaining to the liquid phase or component
Q_M	Mean or maximum value
Q_N	Nominal conditions or pertaining to nuclei
Q_N	Pertaining to a general phase or component, N
Q_R	Pertaining to the reflector
Q_S	Pertaining to the surface
Q_T	Pertaining to thermal neutrons
Q_V	Pertaining to the vapor
Q_∞	Pertaining to conditions far away

Superscripts and other qualifiers

On any variable, Q:

$\bar{Q}$	Mean value of Q
$\dot{Q}$	Time derivative of Q
δQ	Small change in Q
ΔQ	Difference in Q values
Q^m	Pertaining to the material component, m