
NOMENCLATURE

A	pre-exponential factor (s^{-1})
E	activation energy ($J.kg^{-1}$)
\bar{U}_i	mean velocity in tensorial notation ($m.s^{-1}$)
\bar{U}_θ	mean tangential velocity ($m.s^{-1}$)
\bar{U}_z	mean axial velocity ($m.s^{-1}$)
V_i	velocity of particle ($m.s^{-1}$)
Y_i	mass fraction of species i
E	activation energy ($kJ.kg^{-1}$)
q_{ri}	radiative heat flux ($W.m^{-2}$)
d_i	particle diameter of i_{th} class of particle (m)
\dot{S}	gas phase source term due to particles ($kg.m^{-3}s^{-1}$)
\dot{S}_{M_i}	momentum source term in gas phase due to particles ($kg.m^{-2}s^{-2}$)
\dot{S}_E	energy source term in gas phase due to particles ($W.m^{-3}$)
D	diffusion coefficient ($m^2.s^{-1}$)
$G'(d_i)$	mass fraction of spray having diameter above d_i
θ_R	radiation temperature
b	size parameter

n	spread parameter
$d_{\max,i}$	maximum diameter of i th class of particle (m)
$d_{\min,i}$	minimum diameter of i th class of particle (m)
ΔH_{devo}	enthalpy of devolatilization (J.kg^{-1})
ΔH_{char}	enthalpy of char reaction (J.kg^{-1})
c_p	specific heat at constant pressure ($\text{J.kg}^{-1} \cdot \text{K}^{-1}$)
A_p	particle surface area (m^2)
m_p	particle mass (kg)
$m_{p,0}$	initial particle mass (kg)
$f_{v,0}$	initial mass fraction of volatiles in coal
$f_{w,0}$	initial mass fraction of moisture in coal
k	kinetic rate (s^{-1})
Re	Reynolds number
Nu	Nusselt number
Pr	Prandtl number
p	pressure (Pa)
\mathbf{r}	position vector
\mathbf{s}	direction vector
\vec{s}'	scattering direction vector
σ_s	scattering coefficient
$I_\lambda(\vec{r}, \vec{s})$	spectral radiation intensity
n	refractive index

Nomenclature

\emptyset	phase function
Ω'	solid angle
k_i	pressure absorption coefficient of absorbing gas i
p_i	partial pressure (Pa)
$a_{\varepsilon,i}$	weighting factor of emissivity for gray gas i
G_k	generation of turbulent kinetic energy due to mean velocity gradient
G_b	generation of turbulent kinetic energy due to buoyancy
Y_M	contribution of fluctuating dilatation in compressible turbulence to the overall dissipation rate
μ_t	turbulent viscosity
α^*	damping coefficient for turbulent viscosity
q_{ri}	heat flux due to radiative heat exchange between gas and particle phase
Y_i	mass fraction of species i
R_i	net rate of production of species i by chemical reaction
\dot{S}_i	source term
$U_{i,r}'$	stoichiometric constant of reactant i
$U_{j,r}''$	stoichiometric constant of product j
M_w	molecular weight
A	empirical model constant (4.0)
B	empirical model constant (0.5)

Greek symbols

α_t	turbulent thermal diffusivity ($\text{m}^2.\text{s}^{-1}$)
μ_t	eddy viscosity (kg.s.m^{-1})
θ_R	radiation temperature (K)
ρ	density (kg.m^{-3})
σ	Stefan-Boltzmann constant ($\text{W.m}^{-2}.\text{K}^{-4}$)
k	absorption coefficient (m^{-1})
\forall	volume of computational cell (m^3)

Subscripts

i	initial state
j	tensor notation's index
g	gas phase
p	particle phase

Abbreviations

AFT	Adiabatic Flame Temperature
ASU	Air separation unit
BFP	Boiler feed pump
CCS	Carbon Capture and Sequestration
CFD	Computational Fluid Dynamics
CPU	CO ₂ compression and purification unit
DTF	Drop Tube Furnace
FR/EDM	Finite Rate/Eddy Dissipation Model
HPFWH	High pressure feed water heater

Nomenclature

IGCC	Integrated Gasification Combined Cycle
IRZ	Internal Recirculation Zone
LES	Large Eddy Simulation
LPFWH	Low pressure feed water heater
MHX	Multi stream heat exchanger
MILD	Moderate or Intense Low Oxygen Dilution
OCFWH	Open contact feed water heater
PC	Pulverized Coal
PRBM	Peng Robinson equation of state with Boston-Mathias modifications
RANS	Reynolds Averaged Navier Stokes
RFG	Recycled Flue Gas
RR	Recycle Ratio (mass flow rate of recycled flue gas/ mass flow rate of total flue gas produced)
SR	Stoichiometric Ratio
TTD	Terminal temperature difference
WSGGM	Weighted Sum of Grey Gas Model