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NOMENCLATURE AND ABBREVIATIONS

Latin Symbols

Letter	Description	Unit
A	Surface area	m^2
B	Particle mechanical mobility	$m^3/N.s$
C_c	Cunningham slip correction factor	-
D	Particle diffusion coefficient	m^2/s
D	Nozzle diameter	m
D_h	Hydraulic diameter for the annular flow area	-
E	Impactor collection efficiency	%
E	Electric field strength	V/m
E_0	Corona discharge onset field	V/m
E_s	Breakdown field	V/m
E_r	Radial components of the electric field	V/m
E_z	Axial components of the electric field	V/m
F_D	Aerodynamic drag force	N
F_E	Electrostatic force	N
F_G	Gravitational force	N
F_T	Thermal force	N
G_1	Gain of the first amplifier	-
G_2	Gain of the second amplifier	-
I	Current	A
I_e	Electrometer current	A
I_{in}	Input current	A
I_{ion}	Ion current	A
J	Net flux of particles	-
K_E	Translational kinetic energy	$N.m^2/C^2$
Kn	Knudsen number	-
L	Length of the tube	m
N_i	Ion concentration	$ions/m^3$
N_p	Particle number concentration	$particles/m^3$
N_s	Ion concentration above the surface	$ions/m^3$
P	Particle penetration	%
P	Operating pressure	bar
P_r	Reference pressure	bar
Q	Volumetric flow rate of gas	l/min
Q_a	Aerosol flow rate	l/min
Q_{sh}	Sheath air flow rate	l/min

Letter	Description	Unit
Q_i	Total flow arte	l/min
R	Resistor	Ω
Re	Reynolds number	-
R_f	Feedback resistor	Ω
R_i	Input resistor	Ω
S	Sutherland constant	-
Stk	Stokes number	-
T	Absolute temperature	K
T_r	Reference temperature	K
U	Mean flow velocity	m/s
U	Free stream gas velocity	m/s
U_0	Sample velocity in the probe	m/s
\bar{U}	Mean axial flow velocity	m/s
V	Potential	V
V_0	Corona discharge onset voltage	V
V_{diff}	Deposition velocity of particle diffusion	m/s
V_f	Fluid velocity	m/s
V_i	Input voltage	V
V_o	Output voltage	V
V_p	Particle velocity	m/s
V_s	Voltage source	V
V_{TE}	Terminal electrostatic velocity of a charged particle	m/s
Z_i	Ion electrical mobility	$m^2/V.s$
$Z_{i,p}$	Ion electrical mobility at operating pressure	$m^2/V.s$
Z_p	Particle electrical mobility	$m^2/V.s$
Z_p^{max}	Maximum electrical mobility of particle	$m^2/V.s$
Z_p^{min}	Minimum electrical mobility of particle	$m^2/V.s$
a	Particle radius	m
c	Integration constant	-
\bar{c}_i	Mean thermal speed of ions	m/s
d_e	Equivalent diameter	m
d_g	Number-weighted geometric mean diameter	m
d_m	Collision diameter of the particle	m
d_p	Particle diameter	m
d_p^{max}	Particle diameter with maximum mobility	m
d_p^{mid}	Midpoint particle diameter	m
d_p^{min}	Particle diameter with minimum mobility	m
d_{pA}	Equivalent projected surface area diameter	m
\bar{d}	Count median diameter	m
e	Value of elementary charge on an electron	C

Letter	Description	Unit
f	Friction factor	-
g	Gravitational acceleration	-
j	Current density	A/m ²
j_{ion}	Ion current density	A/m ²
k	Boltzmann's constant	J/K
m	Mass	amu
m_i	Ion mass	amu
m_p	Particle mass	amu
n	Number of elementary charges on the particle	-
n_{diff}	Average charge of diffusion charging	-
n_{field}	Average charge of field charging	-
n_p	Particle charge	-
n_s	Saturation charge	-
r	Radial coordinate	m
r_1	Inner radius of the annulus	m
r_2	Outer radius of the annulus	m
s	Steepness of the collection efficiency curve	-
t	Mean residence time	s
u	Flow velocity	m/s
u_i	Ion velocity	m/s
u_r	Radial components of the flow velocity	m/s
u_z	Axial components of the flow velocity	m/s
u_θ	Circumferential components of the flow velocity	m/s
v	Velocity	m/s
z	Axial coordinate	m

Greek Letters

Letter	Description	Unit
χ	Dynamic shape factor	-
δ	Air density	kg/m ³
ϵ	Dielectric constant	F/m
ϵ_0	Electric permittivity of vacuum	F/m
η	Gas viscosity	Pa.s
η_{diff}	Transport efficiency with diffusive particle loss	%
η_r	Reference gas viscosity	Pa.s
κ	Diameter ratio of the inner over the outer cylinder	-
λ	Mean free path	m
λ_r	Reference mean free path	m
μ	Viscosity	Pa.s
ρ	Density	kg/m ³

Letter	Description	Unit
ρ_p	Particle density	kg/m ³
σ	Standard deviation	-
σ_g	Geometric standard deviation	-

Abbreviations

Letter	Description
AC	Alternating Current
ADC	Analog to Digital Converter
ACLDMA	Adjustable Column Length Differential Mobility Analyzer
BCAC	Bipolar Charge Aerosol Classifier
CAG	Combustion Aerosol Generator
CFD	Computational Fluid Dynamic
CPC	Condensation Particle Counter
DC	Direct Current
DOP	Diocetyl Phthalate
DMA	Differential Mobility Analyzer
DMS	Differential Mobility Spectrometer
DVM	Digital Voltmeter
EAA	Electrical Aerosol Analyzer
EAD	Electrical Aerosol Detector
EAS	Electrical Aerosol Spectrometer
EEPS	Engine Exhaust Particle Sizer
ELPI	Electrical Low Pressure Impactor
EMS	Electrical Mobility Spectrometer
FAS	Fast Aerosol Spectrometer
FCE	Faraday Cup Electrometer
GFC	Gas Flow Controller
HEPA	High Efficiency Particulate Air
LPCVD	Low Pressure Chemical Vapor Deposition
LPDMA	Low Pressure Differential Mobility Analyzer
NIH	National Institutes of Health
N-S	Navier-Stokes
PDE	Partial Differential Equation
PIO	Port Input/Output
PTFE	Polytetrafluoroethylene
PVD	Physical Vapor Deposition
RH	Relative Humidity
SEM	Scanning Electron Microscope
SMPS	Scanning Mobility Particle Sizer
SUPG	Streamline Upwind/Petrov-Galerkin
TSI	Thermo-Systems Incorporated
UCPC	Ultrafine Condensation Particle Counter
UV	Ultraviolet
WAA	Whitby Aerosol Analyzer