

無次元数

| | | | | |
|---|--|---|--|--|
| 加速 | 空力弾性 | アルフベン | アルキメデス | アレニウス |
| $\frac{E_s}{\rho g^2 \mu^2}$ | $\frac{2E}{\rho V^2}$ | $\frac{V(\rho \mu_s)^{1/2}}{B}$ | $\frac{g l^3 \Delta \rho_c \rho^2}{\rho \mu^2}$ | $\frac{\epsilon_s}{RT}$ |
| ボーデンシュタイン | ボルツマン | ポンド | ブゲール | ブーシネスク |
| $\frac{VI_s}{D_s}$ | $\frac{\rho c_p V}{e_s \eta_s T_s}$ | $\frac{\rho l^2 g}{\sigma}$ | $\frac{3C_p L_s}{2\rho_s d_s}$ | $\frac{V}{(2g r_h)^{1/2}}$ |
| 毛管現象-浮力 | 毛細管 | カルノー | キャピテーション | 遠心分離機 |
| $\frac{g \mu^2}{\rho \sigma_s}$ | $\frac{\mu V}{\sigma_s}$ | $\frac{T_{11} - T_c}{T_{11}}$ | $\frac{\rho - \rho_s}{\rho_s} \frac{2(\rho - \rho_s)}{\rho V^2}$ | $\frac{\rho r_s \omega^2}{\sigma_s}$ |
| ダンケラーの2番目 | ダンケラーの3番目 | ダンケラーの4番目 | ダルシー | ディーン |
| $\frac{U^2}{D_c \rho}$ | $\frac{QU}{c_p \rho VT}$ | $\frac{QU^2}{h_s T}$ | $\frac{2gHd}{V^2 l}$ | $\frac{\rho V l}{\mu} \left(\frac{l}{2r} \right)^{1/2}$ |
| 弾性-3 | 電気レイノルズ | 電気粘着性 | エリス | エルザッサー |
| $\frac{\rho c_s}{\beta_s E}$ | $\frac{e_s V}{q_b l}$ | $\left(\frac{\rho}{2\pi e_s} \right)^{1/2} \frac{\rho l^2 q}{\mu m_s}$ | $\frac{2\mu V}{\tau_s d}$ | $\frac{\rho}{\mu G \mu_s}$ |
| フョードロフ | FLIEGNER(フライナー) | 流量 | フーリエ熱移動 | フーリエ熱移動 |
| $d_s \left[\frac{4g\rho^2}{3\mu^2} \left(\frac{E_s}{D_s} - 1 \right) \right]^{1/2}$ | $\frac{Q_{cr}(c_p T)^{1/4}}{A(\rho_s + \rho V^2)}$ | $\frac{Q_s}{\omega d_s}$ | $\frac{h_s l}{c_s \rho l^2}$ | $\frac{Dt}{\Gamma}$ |
| 重力 | GUKHMAN | ホール | ハルトマン | 熱移動 |
| $\frac{kg \Delta \rho_s}{\mu V}$ | $\frac{T_s - T_c}{T_s}$ | $\omega_s t_s$ | $\frac{BG^{-1}}{\mu^{1/2}}$ | $\frac{Q_s}{\rho V T}$ |

用語の説明に関しては、以下のページを参照して下さい。

| | | | | | |
|--|--|---|--|---|---|
| バグノルド | バンセン | ピンガム | ピオ熱移動 | ピオ質量移動 | ブレーク |
| $\frac{3\phi\rho_s V^2}{4d_r \rho_s g}$ | $\frac{h.A.}{Q.c}$ | $\frac{\sigma.l}{\mu.V}$ | $\frac{h.l}{h_c}$ | $\frac{\pi.\theta_s}{D}$ | $\frac{\rho V}{\mu(1-l)S}$ |
| BRINKMAN | 気泡ヌッセルト | 気泡レイノルズ | 浮力 | 毛管現象-1 | 毛管現象-2 |
| $\frac{\mu V^2}{h.T}$ | $\frac{Q.d_s}{h_c.\Delta T}$ | $\frac{d_s}{\mu} \left(\frac{\pi}{6} d_s \rho_s f n \right)$ | $\frac{\Gamma W \beta \Delta T}{\mu X V}$ | $\frac{\sigma k^{*2}}{\rho V l}$ | $\left(\frac{\mu a}{\sigma} \right)^2$ |
| クラウジウス | 凝縮-1 | 凝縮-2 | 収縮 | クロッコ | ダンケラー1番目 |
| $\frac{V^2 \rho}{h_c \Delta T}$ | $\frac{h_c}{h_c} \left(\frac{\mu^2}{\rho^2 g} \right)^{1/2}$ | $\frac{l \rho^2 g \lambda}{h_c \mu \Delta T}$ | $\frac{\mu D}{\sigma z}$ | $\frac{V}{\rho \sigma} \left(\frac{\rho \sigma}{\mu} \right)^{1/2} \left(\frac{\rho \sigma}{\mu} \right)^{1/2}$ | $\frac{U l}{V c_s} \frac{t}{t}$ |
| デバイ | DERYAGIN | デュロン | エクマン | 弾性-1 | 弾性-2 |
| $\frac{L}{\rho} \left(\frac{h_c \Delta T}{\rho \sigma} \right)^{1/2}$ | $\theta_s \left(\frac{\rho g}{2\sigma} \right)^{1/2}$ | $\frac{V}{c_s \Delta T}$ | $\left(\frac{\mu}{2\rho \sigma l} \right)^{1/2}$ | $\frac{4t_s \mu_s t_s \mu_s}{\rho d_s^2 \rho d_s^2}$ | $\frac{c_s}{\beta a^2}$ |
| オイラー | 蒸発-1 | 蒸発-2 | 蒸発弾性 | 爆発 | ファニング |
| $\frac{\rho_s}{\rho V^2} \frac{F}{\rho V^2 F}$ | $\frac{V^2}{\lambda_s}$ | $\frac{c_s}{\lambda_s \beta}$ | $\frac{a^2}{\lambda_s}$ | $\frac{\tau_s}{(\rho_s)^{1/2} t^{1/2}}$ | $\frac{2\tau}{\rho V^2}$ |
| フルード | FRUEH | ガリレオ | ゲーチャー | グレーツ | グラスホフ |
| $\frac{V^2}{g l} \frac{V}{g l}$ | $\frac{K_{at}}{a} \left(\frac{m_s}{C_s \rho_s K^2} \right)^{1/2}$ | $\frac{g l \rho^2}{\mu^2}$ | $r_s \left(\frac{\rho g}{2\sigma} \right)^{1/2}$ | $\frac{Q_s c_s}{h l}$ | $\frac{\rho^2 g \beta \Delta T}{\mu^2}$ |
| ヘッドストローム-1 | ハーシー | ホジソン | J-要素熱移動 | J-要素質量移動 | ヤコブ |
| $\frac{\sigma \rho l^2}{\mu^2}$ | $\frac{E_s}{\mu V_s l_s}$ | $\frac{x f \Delta p}{Q_s \rho_s}$ | $\frac{h_c}{c_s M} \left(\frac{c_s \mu}{h_c} \right)^{1/2}$ | $\frac{m_s \rho_s (\mu)^{1/2}}{M (\rho D)}$ | $\frac{\lambda_s}{c_s \Delta T}$ |

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| | | | | |
|---|---|--|---|---|
| ジェイコブ | ジュール | カルマン-1 | KIRPICHEVの熱移動 | KIRPICHEVの質量移動 |
| $\frac{(T - T_{\infty})\rho c_p}{\lambda, \rho}$ | $\frac{2\rho c_p \Delta T}{\mu_w H_w^2}$ | $\frac{\rho \Delta p d^3}{\mu^3}$ | $\frac{Q, I}{h, \Delta T}$ | $\frac{M, I}{D_w \rho R_w}$ |
| ルイス | ルトクヴィスト | リクディス | 音速 | 磁気-ダイナミック |
| $\frac{D\rho c_p}{h}$ | $\frac{GH_m I \mu_o^{1/2}}{\rho^{1/2}}$ | $\frac{G}{\rho^{1/2} H_w I} \left(\frac{1}{g\beta\Delta T} \right)^{1/2}$ | $\frac{V}{a}$ | $\frac{GVBI}{\rho V^2}$ |
| 質量比率 | McADAMS | メルケル | モーメントム | モートン |
| $\frac{m_i}{\pi r_i^2}$ | $\frac{h_i^2 \mu \Delta T}{h_i^2 \rho^2 g \lambda}$ | $\frac{MA_x}{Q_w}$ | $\frac{M, \theta, \rho}{\mu \Delta V}$ | $\frac{g \mu^4}{\rho \sigma^3}$ |
| ペクレの熱移動 | ペクレの質量の移動 | パイプライン | ポアズイユ | ポアソン |
| $\frac{\rho c_p V I}{h}$ | $\frac{IV}{D}$ | $\frac{aV}{2gH_w}$ | $\frac{d^2 \delta p}{\mu V \delta I}$ | $\frac{E_1 - 1}{2E_1}$ |
| プラントル速度比率 | PREDVODITELEV | 放射圧 | レイリー | リージャー |
| $V \left(\frac{\rho}{\tau_w} \right)^{1/2}$ | $\frac{\delta T}{\delta t} \frac{I^2}{D, T_w}$ | $\frac{\eta_{ph} T^2}{3p}$ | $\frac{c_p \rho^2 g I^2 \beta \Delta T}{\mu h}$ | $\frac{K\omega}{a} \left(\frac{m_w}{\pi \rho K^*} \right)^{1/2}$ |
| スロッシュ時間 | ソマーフィールド | 比熱比 | 比速度 | 圧搾 |
| $\left(\frac{\alpha}{\rho \tau_w^2} \right)^{1/2} t$ | $\frac{F \psi^2}{\mu \omega}$ | $\frac{c_{p1}}{c_p}$ | $\frac{\omega(Q_w)^{1/2}}{(gH_w)^{1/2}}$ | $\frac{12\mu\omega}{p_c} \left(\frac{r_w}{\theta_c} \right)^3$ |
| 表面の粘着性 | テイラー | トーマ | トムソン | トムス |
| $\frac{\mu_w}{\mu_c}$ | $\frac{\omega^2 \theta_w \rho^2}{\mu^2}$ | $\frac{p_{at} - p_{at}}{p_{out} - p_{in}}$ | $\frac{tV}{l}$ | $\frac{Q_w}{\rho V^2}$ |

用語の説明に関しては、以下のページを参照して下さい。

| クリビチェフ | クヌーセン | コソヴィック | ラグランジュ-1 | ラグランジュ-2 | レヴェレット |
|-------------------------------------|---|---|--|-------------------------------------|---|
| $\left(\frac{\rho F}{\mu}\right)^2$ | $\frac{L}{l} \frac{1.28 \gamma^2 \mu}{\rho g l}$ | $\frac{\lambda R_c}{c \Delta T_c}$ | $\frac{\Delta p l}{\mu V}$ | $\frac{P}{\mu l^3 \omega_c}$ | $\left(\frac{k}{l}\right)^2 \frac{\rho_c}{\alpha}$ |
| 磁力 | 磁気相互作用 | 磁気プラントル | 磁気圧力 | 磁気レイノルズ | マランゴニ |
| $\frac{\mu_c H_c^2 G l}{\rho V}$ | $\frac{\mu_c H_c^2 r_c}{2 \alpha}$ | $\mu_c G v$ | $\frac{\mu_c H_c^2}{\rho V}$ | $G V l \mu_c$ | $\frac{\delta \sigma}{\delta T} \frac{\delta T}{\delta l} \frac{z'}{\mu D_c}$ |
| ヌセルトの熱移動 | ヌセルトの質量移動 | ヌセルトのフィルム厚 | OCVIRK | オーネゾルゲ | 粒子 |
| $\frac{Q l}{h_c \Delta T_c}$ | $\frac{m l}{D_c} \frac{c l}{\rho V D_c}$ | $\left(\frac{\rho' g}{\mu^2}\right) \delta$ | $\frac{F_c}{\mu V} \left(\frac{w}{r_c} \frac{2 r_c}{l}\right)$ | $\frac{\mu}{(1 \rho \alpha)^{1/2}}$ | $\frac{V l V}{g l}$ |
| パメラーンツェフ | 多孔性の流量 | POSNOV | パワー | プラントル熱移動 | プラントルの質量移動 |
| $\frac{Q l F}{h_c \Delta T}$ | $\frac{V g l}{k^2 \alpha_c \cos \theta}$ | $\alpha_c \Delta T$ | $\frac{P}{(1 \rho \omega_c)}$ | $\frac{c \mu}{h_c}$ | $\frac{\mu}{\rho D}$ |
| レイノルズ | リチャードソン | ロスビー | ラッセル | サックス | シラー |
| $\frac{\rho V l}{\mu}$ | $\frac{g l \Delta \rho}{\rho V}$ | $\frac{V}{2 \omega l}$ | $\frac{V_c}{N Y} \frac{V_c}{Y(-2 \frac{V_c}{Y})^2}$ | $\frac{(P \rho_c)^2}{E_c^2}$ | $V \left(\frac{\rho^2}{2 \mu F}\right)^2$ |
| スタントン | ステファン | ストーク | ストローハル | 構造的な長所 | SURATMAN |
| $\frac{h_c}{\rho c V}$ | $\frac{\eta_c \Delta T_c}{h_c A_c} \frac{\delta T}{\delta l}$ | $\frac{\mu V}{\rho g l^3}$ | $\frac{l \omega_c}{V_c}$ | $\frac{\gamma l}{E}$ | $\frac{\rho l \alpha}{\mu^2}$ |
| トランケーション | 二相流動 | 二相の多孔性流量 | 粘弾性 | ウェーバー | ワイゼンベルグ |
| $\frac{\mu \alpha}{\rho}$ | $\frac{\mu d V}{\sigma l}$ | $\frac{V \mu}{(k_1 k_2)^{1/2} g \Delta \rho}$ | $\frac{E_c}{\mu \omega}$ | $\frac{\rho V l}{\sigma}$ | $\frac{(1 - \theta) V}{d}$ |

Note 1. θ is the solution for: $(1 - \theta)^2 = \frac{\mu \alpha}{\rho}$; Note 2. γ or α indicates a gradient or rate of change coefficient between variables y and x ; Note 3. Y and E are solutions for: $Y^2 - E Y + 1 = 0$

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用語集

- v sonic speed (ft)
- v_p pressure wave velocity (ft)
- A area (ft²)
- A_c cooling surface area per unit volume (ft²)
- A_e conducting area (ft²)
- A_s radiating area (ft²)
- μ carrier mobility, speed/voltage gradient (ft²/m)
- B magnetic induction (gauss)
- c specific heat (Btu/lb°F)
- c_p concentration (mol/l)
- c_v specific heat at constant pressure (Btu/lb°F)
- c_v specific heat at constant volume (Btu/lb°F)
- C_d ratio of dust mass to bed volume (mol/l)
- C_L slope of drag lift curve (dimensionless)
- d pipe or tube diameter (ft)
- d_b bubble or droplet diameter (ft)
- d_i impeller diameter (ft)
- d_j jet diameter (ft)
- d_m mean particle diameter (ft)
- d_p particle diameter (ft)
- D mass diffusivity (ft²/s)
- D_a axial mass diffusivity (ft²/s)
- D_m mass diffusivity in mixture (ft²/s)
- D_m mass diffusivity of moisture in body (ft²/s)
- D_m molecular diffusivity (ft²/s)
- D thermal diffusivity (ft²/s)
- ϵ permittivity (C²/Fm)
- ϵ_0 permittivity of free space (C²/Fm)
- ϵ_s surface emissivity (dimensionless)
- E modulus of elasticity (lb/in²)
- E_f fluid bulk modulus (lb/in²)
- E_t tension modulus of elasticity (lb/in²)
- E_s shear modulus of elasticity (lb/in²)
- E_L tension modulus of elasticity (lb/in²)
- f frequency of formation (s⁻¹)
- f_p pulsation frequency (s⁻¹)
- F_b bearing load per unit area (lb/in²)
- F_c bearing load (lb/in²)
- F force on immersed body (lb/in²)
- F_s bearing load length (lb/in²)
- F_r resistance force on immersed body (lb/in²)
- g gravitational acceleration (ft/s²)
- G electrical conductivity (ohm⁻¹/m)
- h thermal conduction coefficient or thermal conductivity (Btu/ft²h°F)
- h_g thermal conductivity of gas (Btu/ft²h°F)
- h_c radiant heat transfer coefficient (Btu/ft²h°F)
- h_f heat transfer coefficient (Btu/ft²h°F)
- H head loss (ft)
- H_m magnetizing force (Oer)
- H_s static head (ft)
- H_p head produced per stage (ft)
- λ porosity, ratio of void to solid volume (dimensionless)
- K permeability (ft)
- K_h horizontal permeability (ft)
- K_v longitudinal permeability (ft)
- K worn ball-rubber (ft)
- l characteristic length or dimension (ft)
- l_b bearing length (ft)
- l_r reactor length (ft)
- L mean free path of molecules (ft)
- L Debye length (ft)
- L mean radiator path length (ft)

用語集

- m mass of body (m)
- m mass transfer rate or mass transfer coefficient (lb)
- m_p particle mass (m)
- m_s wet mass per unit length (mol)
- M mass transfer per unit area per unit time (mol/m²)
- M_e mass of moisture evaporated per unit area per unit time (mol/m²)
- M_c molecular mass (lb/lb)
- n number of nucleation centers per unit area (ft⁻²)
- n number of electrons per unit volume (ft⁻³)
- N natural vertical frequency of fluid element above its equilibrium state in a density-stratified atmosphere (ft⁻¹)
- p prestress (lb/in²)
- p_s average static pressure (lb/in²)
- p_c capillary pressure (lb/in²)
- p_d dynamic pressure (lb/in²)
- p_i total pressure at pump inlet (lb/in²)
- p_o atmospheric pressure (lb/in²)
- p_e total pressure at pump outlet (lb/in²)
- p_s local static pressure or pressure drop (lb/in²)
- p_v fluid vapor pressure (lb/in²)
- Δp pressure drop (lb/in²)
- P power input to system (lb/in²)
- q charge (q)
- q_e electron charge (q)
- q_s space charge density (q/ft³)
- Q liberated heat per unit mass (Btu/lb)
- Q_s heat flux per unit area per unit time (Btu/ft²)
- Q_v heat flow per unit time or heat flow rate (Btu/h)
- Q_v heat liberated per unit volume per unit time (Btu/ft³)
- Q_m mass flow rate (mol)
- Q_v volume flow rate (ft³/s)
- Q_w fuel weight flow per unit time (lb/h)
- r radius from explosion to reference point (ft)
- r_b blast wave radius (ft)
- r_s bearing radius (ft)
- r_c bend radius of curvature (ft)
- r_h hydraulic radius, ratio of wetted cross-sectional area to perimeter (ft)
- r_p probe radius (ft)
- r_s shaft radius (ft)
- r_c tank radius (ft)
- r_w wire radius (ft)
- R gas constant (ft²/s²)
- R fractional difference in moisture content of bodies (dimensionless)
- R_m fractional change in moisture content of body (dimensionless)
- S ratio of particle area to volume (ft⁻¹)
- t time (ft)
- t ratio of average time path to average velocity (ft)
- t reaction or relaxation time (ft)
- t translation time (ft)
- τ time constant (ft)
- t time constant (ft)
- t time constant (ft)
- T temperature (T)
- T_s sink temperature (T)
- T_g ambient gas temperature (T)
- T_s source temperature (T)
- T_b initial temperature of body (T)
- T_c bulk liquid temperature (T)
- T_w wall bulb temperature at moist surface (T)
- T_m saturation temperature (T)
- T_s total stagnation temperature (T)

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ΔT temperature differential (K)
 ΔT_b body temperature change (K)
 ΔT_c temperature difference across a fluid film (K)
 ΔT_r temperature range of interest (K)
 ΔT_s surface temperature minus saturation temperature (K)
 ΔT_w temperature difference between wall and gas stream (K)

U reaction rate (mol/l³)

V velocity or flow speed (M/s)
 V_b bearing surface speed (ft/s)
 V_c terminal free fall particle velocity (M/s)
 V_{max} maximum gas velocity when expanded to zero temperature (M/s)
 V_r reference velocity (M/s)
 V_s transitional speed (M/s)
 V_w wind speed (M/s)
 ΔV velocity difference (M/s)

w clearance width (ft)
W weight (mg/l³)

X volume (ft³)
 X_c total volume (ft³)

y vertical coordinate (ft)
Y height of obstacle (ft)

z fluid depth (ft)

$\dot{\alpha}$ shear strain rate (1/s)
 β temperature coefficient of volumetric expansion (1/K)
 β_p coefficient of bulk expansion (1/K)
 γ specific heat ratio (dimensionless)
 γ_w weight decay (min/l³)
 T_s specific gravity of fluid (dimensionless)
 ρ_s specific gravity of particles (dimensionless)

E activation energy (ft²/l²)
E explosive energy (mg/l³)

A rate of deformation (1/s)
 k_B Boltzmann constant (min²/l²)
 k_S Stefan-Boltzmann constant (min²/l²)
 k_{SB} Stefan-Boltzmann constant (min²/l²)

θ contact angle (degrees onless)
 g clearance between cylinders (ft)
 h film thickness (ft)
 h_f fluid layer thickness (ft)
 h_c condensed film thickness (ft)
 h_w wick thickness (ft)

J_c heat of condensation (ft²/l²)
 J_e heat of vaporization per unit mass or heat of evaporation (1/l²)

μ absolute viscosity (mg/l²)
 μ_f permeability of free space (min²/l²)
 μ_m magnetic permeability (mg/l²)
 μ_p absolute viscosity in plastic state (mg/l²)
 μ_s surface viscosity (mg/l²)
 μ_r zero shear viscosity (mg/l²)
 μ_t turbulent viscosity (mg/l²)

ρ mass density (mg/l³)
 ρ_a mass density of air (mg/l³)
 ρ_c mass density of particle cloud (mg/l³)
 ρ_d mass density of dust (mg/l³)
 ρ_l mass density of liquid (mg/l³)
 ρ_p particle mass density (mg/l³)
 ρ_v vapor mass density (mg/l³)
 $\Delta \rho$ mass density difference (mg/l³)
 $\Delta \rho_{fl}$ mass density difference between fluids (mg/l³)

用語集

$\Delta \rho$ mass density difference between objects and fluid (mg/l³)
 σ interfacial tension (min²)
 σ_s surface tension (min²)
 σ_y stress at elastic yield (mg/l²)
 σ_w thermal gradient (1/l²)
 τ shear or friction stress (mg/l²)
 τ_s fluid shear stress at surface (mg/l²)
 τ_w wall shear stress (mg/l²)
 τ_0 shear stress when $\omega = \mu_0 \cdot \dot{\gamma}^2$ (mg/l²)
 ξ air drag coefficient of particle (dimensionless)
 ψ ratio of radius of clearance to diameter (dimensionless)
 ω angular velocity or rotational speed (1/s)
 ω_c centrifugal natural frequency of wing (1/s)
 ω_w rotational speed of agitator (1/s)
 ω_c cyclotron frequency (1/s)
 ω_p vibrational frequency (1/s)
 ω indicates time derivative (1/s)

互いに等しい無次元数

Cauchy = (Mach)²
 Colburn = Prandtl Mass Transfer
 Cowling = 1/Allen
 Damköhler's F_{th} = Reynolds
 Eckert = Dukinog
 Froude = Bond
 Hadstrom Z = Bingham
 Heike = (Mach)²
 Jeffrey = 1/Stokes
 Karman Z = Allen
 Laval = Crocco
 Le Ross = Cavitation
 Magnetic Mach = Allen
 Newton = Euler
 Plasticity = Bingham
 Reech = 1/Froude
 Sarrau = Mach
 Schmidt = Prandtl Mass Transfer
 Semenov = 1/Allen
 Sherwood = Nusselt Mass Transfer
 Smolukowski = 1/Knudsen
 Thing = Boltzmann

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