

Table 2.1: Comparison of the parameters used in the present simulations and those in the corresponding experiments for colloids in KCl solutions.

Parameters in physical units	Symbols	Corresponding experimental values (KCl solution)	Present simulation values
Radius of colloids	a	100×10^{-9} [m]	5 [Δ]
Diameter of colloids	d	200×10^{-9} [m]	10 [Δ]
Bjerrum length	λ_B	0.7×10^{-9} [m]	$1/4\pi$ [Δ]
Elementary charge	e	1.6×10^{-19} [A · s]	1 [e]
Thermal energy	$k_B T$	$298.15 k_B = 4.11 \times 10^{-21}$ [m ² · kg/s ²]	1 [$\eta^2 \Delta / \rho$]
Zeta potential (typical value)	ζ	2.57×10^{-2} [kg · m ² /A · s ³]	1 [$\eta^2 \Delta / \rho e$]
Phoretic velocity (typical value)	V	2.5×10^{-6} [m/s]	5×10^{-3} [$\eta / \rho \Delta$]
Permittivity of solvent	ϵ	$78.5 \epsilon_0 = 6.95 \times 10^{-10}$ [A ² · s ⁴ /kg · m ³]	1 [$\rho e^2 / \Delta^2 \eta^2$]
Viscosity of solvent	η	8.90×10^{-4} [kg/m · s]	12.7 [η]
Density of solvent	ρ	997 [kg/m ³]	0.1 [ρ]
Diffusion constant of ions (typical value)	D	2×10^{-9} [m ² /s]	0.285 [η / ρ]
Frequency of AC field	ω	$10^5 - 10^9$ [1/s]	$5 \times 10^{-3} - 50$ [$\eta / \rho \Delta^2$]
Parameters in dimensionless units	Symbols	Corresponding experimental values (KCl solution)	Present simulation values
Zeta potential	$y = e\zeta / k_B T$	1	1
Friction constant of ions	$m_\alpha = 2\epsilon(k_B T)^2 / 3\eta e^2 D$	0.184	0.184
Reynolds number of colloids	$\text{Re} = \rho d V_0 / \eta$	1×10^{-3}	1×10^{-3}
Frequency of external electric field	$\omega^* = \omega \rho a^2 / \eta$	$10^{-3} - 10$	$10^{-3} - 10$
Frequency of momentum diffusion	$\omega_\nu^* = (\nu / d^2) \rho a^2 / \eta$	0.25	0.25
Frequency of ionic diffusion	$\omega_D^* = (D / d^2) \rho a^2 / \eta$	5.6×10^{-4}	5.6×10^{-4}