Electrostatic Repulsive Energy Calculation between Two Cylindrical Particles Suspending in a Monovalent Ionic Solution

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The electrostatic repulsive energy between two cylindrical particles was calculated with the consideration of their orientation. The electrostatic energies were calculated by solving nonlinear Poission-Boltzmann (P-B) equation numerically with the assumption of Derjaguin approximation. Due to the anisotropy of the cylindrical shape, the interaction repulsive energy varied drastically with respect to their configurations. For the model cylindrical particles with unit length, cylinders aligned in the end-to-end configuration showed largest repulsive energy and crossed particles had lowest interaction energy. This configuration dependency is due to the curvature effect of the interacting surfaces. The curved surfaces showed lower repulsive energy than flat surfaces at the same interacting surface area. The outcomes of this research would be applicable in predicting colloidal stability of cylindrical particles.