

Electrical Interaction between Two Cylinders with an Ion-Penetrable Charged Membrane in an Oil/Water Interface

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The electrical interaction between two long, parallel cylinders each is covered by an ion-penetrable charged membrane immersed in an oil/water interface is investigated. The effects of contact angle, radius of cylinder, and membrane thickness on the electrical interaction force are examined. The results of numerical simulation reveal that the following conditions lead to a greater electrical interaction force: (i) a larger contact angle, i.e., a larger fraction of a cylinder in the oil phase, (ii) a larger cylinder radius, and (iii) a thinner membrane. For a fixed ionic strength, the electrical interaction force is insensible to the type of electrolytes in the water phase, in general. However, if two cylinders are close enough, then the higher the valence of counterions the greater the electrical interaction force.