Abstract Submitted
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Ion-induced interactions between charged macroions and dielectric inhomogeneities JOS ZWANIKKEN, MONICA OLVERA DE LA CRUZ, Northwestern University — We present a theoretical study of the interactions between macroions in ionic solutions, that are induced by the surrounding electrolyte. In a first scenario, we consider responsive nanoparticles with positively and negatively charged surface groups, and predict that thermal fluctuations of the net surface charge are responsible for an effective attraction, as a chemical analogue of the atomic London-forces. In a second scenario, we consider nanoparticles in solvents with a low dielectric permittivity, where the Coulomb interactions between ions easily exceed the thermal energy. We predict an ionic condensation in the confinement between two nearby nanoparticles, where the suppression of fluctuations leads to a locally dense state of ions, and a consequent strong effective attraction between the nanoparticles. The induced potential between the nanoparticles is also related to the ion-nanoparticle interactions, by e.g. Van der Waals, surface charge, or image charge attractions. Recently developed theoretical methods are discussed, based on earlier work [1,2].

[1] J. W. Zwanikken, and M. Olvera de la Cruz, Phys. Rev. E 82, 050401(R) (2010).
[2] J. W. Zwanikken, P. K. Jha, and M. Olvera de la Cruz, J. Chem. Phys. 135, 064106 (2011);

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