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Polarization Model for the Hydration Forces. OSCAR CALVO, MARIAN MANCIU, Physics Department, University of Texas at El Paso, ELI RUCKENSTEIN, Chemical and Biological Engineering, State University of New York at Buffalo — The interactions between hydrophilic surfaces in water cannot be always explained on the basis of the traditional DLVO theory, and an additional repulsion, the "hydration force" is sometimes required to accommodate the experimental data. While this force is in general associated with the organization of water in the vicinity of the surface, different models for the hydration were typically required to explain different experiments. We will show that the polarization model for the double layer/ hydration, which account for the correlations between neighboring dipoles, is consistent with a number of experiments, such as (i) the repulsion almost independent of the electrolyte concentration between neutral lipid bilayers, with a short decay length (∼2Å), (ii) the repulsion between weakly charged mica surfaces, with a longer decay length (∼10 Å), exhibiting not only a dependence on the ionic strength, but also strong ion specific effects. (iii) the repulsion between silica surfaces. It is shown that, for a particular structuring of water in the vicinity of a flat surface (in ice-like layers)., the polarization model leads to an oscillatory behavior of the polarization and a non-local dependence on the local electric field, as suggested by Molecular Dynamics simulations.

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