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Electrostatics effects on normal load capacity of two like-charge hydrogels AYKUT ERBAS, JOS ZWANIKKEN, MONICA OLVERA DE LA CRUZ, Northwestern University, OLVERA DE LA CRUZ TEAM — In mammalian joints, an effective lubrication mechanism is maintained under extremely high pressures due to charged polymeric structures coating the surfaces of the relatively moving tissues. Equally low frictional forces are also observed experimentally in the shear motion of polyelectrolyte gel and brush bilayers. The lubrication capabilities of these systems are attributed to either a polymer-free zone, separating the bilayers or hydration layers that can dissolve polymeric segments. Previous hypothesis have stated that the separation zone should decrease the polymer-polymer physical contact, and hence, result in only viscous friction of the liquid filling this layer. In this study, using extensive Molecular Dynamics simulations and analytical tools, we investigate the separation zone under compression at high electrostatic strengths. We show that Coulombic interactions significantly change the thickness of the separation zone as well as the normal pressure that a hydrogel bilayer can support upon strain-control deformations. We observe that under high pressures the separation zone completely disappears. As a result, the number of polymer-polymer contacts increases. We speculate that the frictional forces between polymer segments can reduce the efficiency of the lubrication

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