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The effects of interfacial polarization on long-range interaction between aqueous phases in oil MENG SHEN[1], HONGHAO LI[2], MONICA OLVERA DE LA CRUZ[3], Northwestern Univ — Metal ions are encapsulated in metalloamphiphile phase together with the counter-ions, and then dispersed in oil in extractive metallurgy. It is found in recent experiments and atomistic simulations that the neutral ion-containing phases are prone to aggregation due to long-range inter-capsule attractions, counterintuitive with the otherwise short-range dipolar interactions. To understand this long-range attraction, we perform coarse-grained simulations that considers interfacial polarization, and track the ion-ion, ion-polarization, and polarization-polarization inter-capsule interactions. The effects of ion size and valency, ion concentration, capsule size and curvature, and permittivity contrast are investigated. Our results show that the inter-capsule ion-ion interaction is significantly increased in the presence of polarization due to redistribution of ions, furthermore, the inter-capsule ion-polarization interaction is comparable with inter-capsule ion-ion interactions. The redistribution of ions potentially leads to local deformation of the capsules. The research paves the way for understanding self-assembly in phases mixed in oil that are ubiquitous in biological systems.

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