Abstract Submitted
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Non-equilibrium depletion interactions: first things attract, then they repel BENJAMIN DOLATA, ROSEANNA ZIA, Cornell University — Non-Equilibrium depletion interactions in colloidal dispersions are studied theoretically via a combination of asymptotic and numerical solutions of the Smoluchowski equation. A pair of probes at arbitrary separation is driven by an external force at arbitrary orientation through a suspension, deforming the surrounding microstructure. The degree to which the structure is distorted, and the shape of this deformation, depends on the separation between the probes, on the orientation of the pair to the driving force, and on the strength with which the probes are forced relative to the entropic restoring force of the suspension particles. The resultant non-equilibrium osmotic pressure gradients give rise to both drag and interactive forces between the probes. When the external force is zero, the depletion attraction of Asakura and Oosawa is recovered. When an external force is applied, the interactive force can lead either to attraction or repulsion, as well as deterministic re-orientation of the probes relative to the external force, depending on initial separation, orientation, and strength of forcing. The use of this model for interrogation of non-continuum and elastically networked materials is explored.

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