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Solvophobic Solvation Forces between Nanoparticles: Size, Shape, and Solvent Effects YONG QIN, KRISTEN A. FICHTHORN, The Pennsylvania State University — The hydrophobic effect is an important phenomenon that can play a central role in biological and colloidal systems. Although hydrophobic hydration has been extensively studied, this is just a specialized case of the more general phenomenon of "solvophobic solvation", which can occur in a wide variety of applications involving solutes in non-aqueous solutions, including colloid and polymer suspensions and assemblies. We report results from molecular-dynamics simulations of solvophobic nanoparticles immersed in n-decane liquid. Analogous to aqueous systems, we observe dewetting in the inter-particle region and attractive solvation forces when the particle separation becomes smaller than a critical value. We show that the critical separation can be affected by particle size and shape, and, in contrast to predictions by theories of hydrophobic hydration; it can be larger for small particles than for large ones. The complex size and shape dependence of solvophobic inter-particle forces allows new prospects for creating selective nonaqueous colloidal assemblies.

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