Small is different: emergent fluid behavior in the nanoscale

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When the scale of materials structures is reduced to the nanoscale, emergent physical and chemical behavior often occurs, that is not commonly expected, or deduced, from knowledge learned at larger sizes. Using computer-based simulations [1], often in conjunction with laboratory experiments, we highlight and illustrate such behavior in diverse emergent phenomena in nano-scale liquid systems. Topics that we discuss include: singly and multiply charged water nanoclusters, shape transitions and electrocrystallization of dielectric nanodroplets, trans-membrane transport processes via capillary nanojet injection of a liquid through bilayer membranes, and coexistence of correlated electron liquids and pinned Wigner crystals under high magnetic fields in the fractional quantum Hall effect regime, observed recently for 1/3 fractional filling, and its neighborhood, in 2D semiconductor quantum dots,

1. U. Landman, “Materials by Numbers: Computations as Tools of Discovery”, Proc. Nat. Acad. Sci. (USA) **102**, 6671 (2005).

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