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Electrolyte-Mediated Assembly of Charged Nanoparticles SUMIT KEWALRAMANI, MICHAEL BEDZYK, GUILLERMO GUERRERO-GARCA, LIANE MOREAU, JOS ZWANIKKEN, CHAD MIRKIN, MONICA OLVERA DE LA CRUZ, Northwestern University — Solutions at high salt concentrations are used to crystallize or segregate colloids, proteins and polyelectrolytes via an unknown mechanism referred to as "salting-out". Here, we show salting-out is a long-range interaction controlled by electrolyte concentration and nanoparticle charge density. Small-angle X-ray scattering (SAXS) shows that DNA-coated Au nanoparticles designed to prevent inter-particle assembly via Watson-Crick hybridization undergo "gas" to FCC to "glass-like" transitions with increasing NaCl or $CaCl_2$ concentration. Simulations reveal that the crystallization is concomitant with inter-particle interactions changing from purely repulsive to a long-range potential well condition. Liquid-state theory explains this attraction as a sum of cohesive and depletion forces. Our work reveals the mechanism behind salting-out and suggests new routes for the successful crystallization of colloids and proteins using concentrated salts.

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