We examine the issue of whether dispersion forces can lead to crystallization in a system of charged nanoparticles in aqueous solution with NaCl salt. To this end, we determine the effective pair potential (EPP) among the nanoparticles [FIG.1], starting from a model system that explicitly includes the salt ions and the water molecules. In particular, we use the well-tested simple point charge extended (SPC/E) model for the water molecules and the reference interaction site model (RISM) equation complemented with the hypernetted-chain (HNC) closure to compute the pairwise correlations [FIG.2] among the components of this model system. The EPP at infinite-nanoparticle dilution is obtained from these correlations after contracting the salt ions and water molecules following the method presented in J. Phys. Chem. B 110, 22702 (2006). The dressed-interaction-site theory (DIST) discussed in that work shows that the corresponding EPP has a short-range contribution plus a screened electrostatic (Yukawa) potential with renormalized charges and dielectric constant. A polynomial-fitting scheme is devised to quantify the dependence of the effective electrostatic parameters on the underlying salt concentration. As such, we derive the phase diagram [FIG.3] for our system using a mean-field approach based upon the computed EPP, for a range of (finite) nanoparticle densities and salt concentrations, and demonstrate crystallization. Findings from our model also suggest the possibility of crystallization occurring preferentially among nanoparticles with negative charges than those with positive charges of the same magnitude and thus exhibiting charge asymmetry due to solvation effects [FIG.3].