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Phase Diagram of a Model of Nanoparticles in Electrolyte Solutions XIAOFEI LI, STEVEN LETTIERI, NATHANIEL WENTZEL, JAMES GUNTON, Lehigh University — We obtain accurate fluid-fluid coexistence curves for a recent simple model of interacting nanoparticles that includes the effects of ion-dispersion forces. It has been proposed that these ion dispersion forces provide at least a partial explanation for the Hofmeister effect [Phys. Rev. Lett., 87:168103, 2001]. We study a model of aluminum oxide nanoparticle [Colloids and Surfaces A, 319:98-102, 2008] for three different electrolyte solutions with added salt type being sodium chloride, sodium iodide and a non-polarizable salt. We observe that the fluid-fluid coexistence curves depend substantially on the identity of added salt; this provides an efficient way of tuning the phase behavior of nanoparticles. The methods we employ include finite-size scaling (FSS), multicanonical histogram reweighting and Gibbs ensemble methods. We show that, as expected, all three cases belong to the universality class. The scaling fields and critical point parameters are obtained in the thermodynamic limit of infinite system size by extrapolation of our FSS results.

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