

A mode-mode coupling scheme of colloidal electrolyte friction

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Self-diffusion of spherical colloidal polyions immersed in an electrolyte solution depends on electrostatic, excluded volume and solvent-mediated hydrodynamic interactions between the ionic species. The electro-hydrodynamic coupling of the electrolyte and counter-ions to the polyion motion gives rise, in particular, to an additional contribution to the polyionic friction coefficient. On the basis of the primitive model and generalized Smoluchowski diffusion equation, a simplified mode-mode coupling scheme is solved for quantifying this electrolyte friction effect. The influence of the finite sizes of the small electrolyte ions is accounted for using mean spherical approximation expressions of static pair correlation functions for unequal sizes. The importance of hydrodynamic interactions is assessed by comparing results from the expressions with and without hydrodynamic interactions included.