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Surface Electric Potential of Macroions between the Limits of Small Ions and Charged Nanocolloids BENXIN JING, Y. ELAINE ZHU, Department of Chemical and Biomolecular Engineering, University of Notre Dame — The surface electric potential of macroions in the size of 1-10 nm in aqueous solutions is critical to understand the supramolecular assembly involving biomacromolecules, charged nanoparticles and nanoclusters and their resulting material properties. However, the electric potential of these macroions could not be accurately determined because their sizes fall in between the limits of small ions and plain charged nanocolloids, while solving the non-linear Possion-Boltzmann equation remains a grand challenge to date. In this work, we investigate polyhedral oligomeric silsesquioxane (POSS) with 8 amine terminal groups as a model macroion. We employ a single molecule fluorescence technique, fluorescence correlation spectroscopy (FCS), combined with photon counting histogram (PCH) to quantitatively measure the local proton concentration, which is the local co-ion concentration in vicinity of POSS with 1.5 nm in diameter. By changing the ionic strength of aqueous solution and the distance between pH-sensitive fluorescence probe and POSS, we quantitatively determine the proton concentration gradient. The distance dependent local pH can be simply analyzed to obtain the surface electric potential of the POSS macroion without the necessity to solve the non-linear Possion-Boltzmann equation.

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