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Long range transport of colloids in aqueous solutions DANIEL FLOREA, SAMI MUSA, JACQUES M.R.J. HUYGHE, HANS M. WYSS, Eindhoven University of Technology — Colloids in aqueous suspensions can experience strong, extremely long range repulsive forces near interfaces such as biological tissues, gels, ion exchange resins or metals. As a result exclusion zones extending over several millimeters can be formed. While this phenomenon has been previously described, a physical understanding of this process is still lacking. This exclusion zone formation is puzzling because the typical forces acting on colloidal particles are limited to much shorter distances and external fields that could drive the particles are absent. Here we study the exclusion zone formation in detail by following the time and distance-dependent forces acting on the particles. We present a simple model that accounts for our experimental data and directly links the exclusion zone formation to an already known physical transport phenomenon. We show that the effect can be tuned by changing the zeta potential of the particles or by varying the species present in the aqueous solution. We thus provide a direct physical explanation for the intriguing exclusion zone formation and we illustrate how this effect can be exploited in a range of industrial applications.

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