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Attraction between like-charged colloidal particles at a water-air interface WEI CHEN, TAI KAI NG, PENGER TONG, Department of Physics, Hong Kong University of Science and Technology, SUSHENG TAN , WARREN FORD, Department of Chemistry, Oklahoma State University — Like-charged colloidal particles at aqueous interfaces have been found to experience attractive interactions but the origin of the attraction is not well understood. Here we report a detailed experimental study of attractive interactions between micron-sized charged polystyrene latex spheres at a water-air interface. Atomic force microscope images show 100nm-sized patchy regions of ionized polystyrene-rich domains on the colloidal surface, indicating that the surface charge distribution of the particles is not uniform. The surface heterogeneity will introduce in-plane diploes for the interfacial particles, causing attractive interactions when the inter-particle distance becomes small. The experiment reveals that the interfacial particles can form stable bounded clusters with different configurations. A theoretical model is developed to explain the experimental results using a combined interaction potential of in-plane dipole attraction and out-of-plane dipole repulsion as well as screened-Coulomb repulsion at short distances. Work supported by the Research Grants Council of Hong Kong SAR under Grant No. HKUST603003.

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