ELECTRIC FIELD-DRIVEN ASSEMBLY OF SULFONATED POLYSTYRENE MICROSPHERES

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Nano- and micrometer spherical particles are playing a very important role in today's technology world. Particles interact and dictates the mechanisms in various systems, ranging from cosmetic products to food. Due to their large surface to volume ratio, self-organization and assemble of particles are required to further development of new technology, which is reliant on smaller structure and materials. We designed assembly of micro-spherical particles at liquid interfaces offers many advantages for materials development, and can be performed by various means. Electric fields provide a flexible method for structuring particles on droplets, utilizing electrohydrodynamic circulation flows, dielectrophoretic and electrophoretic interactions. In addition to the properties of the applied electric field, the manipulation of particles often depends on the intrinsic properties of the particles to be assembled. Here, we present an easy approach to produce polystyrene micro-particles with different electrical properties. These particles are used for investigations on electric field-guided particle assembly in bulk and on surfaces of oil droplets. By sulfonating polystyrene particles, we make a set of particles with a range of dielectric constants and electrical conductivities related to the sulfonation reaction time. I will present the diverse particle behavior driven by electric fields, including particle assembly at different droplet locations, particle chaining, and formation of ribbon-like structures with anisotropic properties. In addition, I will demonstrate how the different particle coverage on a drop surface influences both the transient and steady-state droplet deformation.

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