

# Biomimetic folding particle chains

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We show how microfluidics can be used in combination with AC electric fields to assemble flexible chains of colloids [1] with full control over the sequence of particles on the single particle level. Our goal is to experimentally observe and control the self-folding of colloidal chains [2]. In analogy to how the sequence of amino acids determines the folded 3-D structure of proteins, we aim to control the folding of our colloidal polymers by the sequence of particles in the string [2,3]. These colloidal strings simulate biological polymers, but can be observed in real-time by optical microscopy. The interactions between the particles are determined by the individual surface modifications and by the solvent composition. Since simulations suggest that the prerequisites to determine a specific folded structure are different isotropic interactions plus an attractive directional interaction between the colloids [2], we synthesize particles with both isotropic and patchy interactions. Using confocal microscopy and holographic microscopy these interaction potentials between the different species as well as the resulting folding behavior are studied.

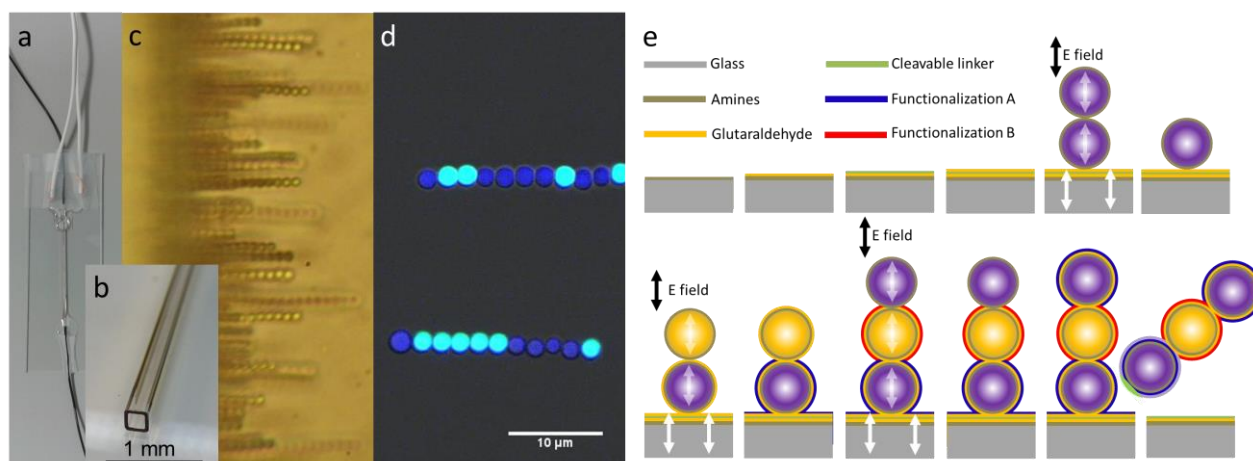


Figure 1 **a.** capillary with external electrodes, **b.** zoomed capillary, **c.** brightfield micrograph of induced dipole driven string formation at the capillary wall, **d.** confocal micrograph of fluorescent polystyrene particles aligned in arbitrary sequences, **e.** strategy to make multiple strings with identical sequences in parallel: subsequently render the wall sticky for aminated particles, applying an AC field to stick at most one particle on one spot, remove excess particles, make the first generation of particles sticky and stick at most one second particle to the first particles, neutralize the wall and determine the interaction type of the first generation of particles with a functionalizing compound, making the second generation sticking and add a third generation, neutralize and determine the interaction type of the second generation and so forth.

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