

DY 5: Keynote Lecture I

Time: Monday 9:30–10:00

Location: ZEU 222

Invited Talk

DY 5.1 Mon 9:30 ZEU 222

Dynamically Reconfigurable Soft Matter in External Fields: Smart Particle Gels, Shape-Changing Clusters and Self-Propelling Microbots — ●ORLIN D VELEV — Department of Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC 27695, USA

This talk will focus on principles of using magnetic and electric fields to manipulate new classes of soft matter assembled from responsive, asymmetric, and motile particles. Metallo-dielectric particles acquire complex polarization patterns in external fields, leading to their multi-directional interactions and assembly. First, we will describe how magnetically responsive Janus microcubes can be assembled into clusters and chains that spontaneously reconfigure when the external magnetic

field is turned on and off. The magnetization of the metallic facets leads to directional dipole-dipole and field-dipole interactions. The folding pattern of the clusters is encoded by the orientational sequence of the cubes. Assemblies of specific sequences demonstrate prototypes of new microbot and colloidal origami structures. The dynamically reconfiguring clusters can also be designed to be self-motile in media with non-Newtonian rheology or to serve as microrheometers. In the second part of the talk, we will discuss a new smart gel system of ultra-flexible chains from super-paramagnetic nanoparticles coated by condensed lipid shells. The field collects the nanoparticles into magnetically responsive filaments. The soft, "snappable," capillary interactions also enable the assembly of patchy particles, magnetically self-repairing gel networks and novel inks for 3D printing.