Design of Smart Materials using Liquid Crystallinity

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Liquid crystals (LCs) are an intermediate state of matter possessing both the mobility of isotropic fluids and the long-range molecular ordering of crystalline solids. In this presentation, we will discuss how the unique combination of properties in LCs can be exploited to design a new class of Smart Materials [1] that not only autonomously sense a range of stimuli and optically report them, but also transform their environment via triggered release of microcargo that were initially trapped within the LCs. The resulting LC materials *self-report* and *self-regulate* their chemical response to targeted physical, chemical and biological events in ways that can be preprogrammed through an interplay of elastic, electrical double-layer, buoyant and shear forces in diverse geometries (e.g., wells, films and droplets). Especially, we will show the first example of a material with the capability to provide a self-regulated release of chemoactive agents in response to living cells (like immune system in human body).

[1] Y.-K. Kim, X. Wang, P. Mondkar, E. Bukusoglu, and N. L. Abbott, NATURE, 557, 539 (2018).