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Giant soft-memory in liquid crystal-nanocomposites RAVINDRA KEMPAIAH, YIJING LIU, ZHIHONG NIE, University of Maryland, College Park, RAJRATAN BASU, US Naval Academy — Here, we report a novel way of introducing giant, non-volatile soft-memory in a nanocomposite comprising of amphiphilic polymer functionalized barium titanate ($BaTiO_3$) nanoparticles and *isotropic* phase of 5CB liquid crystal. Doping of pure ferroelectric NPs in isotropic phase of 5CB creates nanoscopic domains of highly ordered regions as 5CB molecules arrange themselves around the NPs and we call these regions, *pseudonematic domains.* Here, mesogens can *electromechanically* rotate the $BaTiO_3$ NPs within the domain, along the direction of applied electric field. These domains are spatially and thermodynamically locked-in and retain their directional orientation and net polarization even after the applied electric field is switched off. We call this net remnant polarization or hysteresis, '*soft memory*'. When NPs are functionalized with amphiphilic block copolymers, self-assembly of mesogens occurs at the interface of polymer tethers and nanoparticles via combination of non-covalent coupling and π-π stacking interaction and this results in multi-fold enhancement in the volume of pseudonematic domains and subsequent increase in the soft memory. This work provides new insight into understanding the interaction of nanoparticles, polymers and liquid crystal and potentially lead to the creation of nanoelectrocmehanical (NEMS) storage device using functionalized nanoparticles.

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