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Observation of coupling between microscopic diffusion and macroscopic elasticity in soft matter

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Material diffusion processes are fundamentally driven by local microscopic interactions. Many important applications of diffusion, including drug delivery, are based on this concept. However, some orientational microscopic interactions can generate a collective macroscopic organization. Thus, macroscopic boundary conditions may affect the microscopic diffusion if orientational interactions are involved in the diffusion process.
Liquid crystalline materials are the best examples of orientationally correlated (oriented) molecular complexes where we can observe such phenomena. However, many other self-organized (oriented) material systems, particularly those present in the biological tissue, have similar behavior.
My presentation will describe the experimental observation and theoretical modeling of the diffusion of chiral guest molecules in a nematic liquid crystal host and will discuss the possible implications of our observation in the drug diffusion phenomena in the biological tissue. Future developments will be also shortly discussed.

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