MAR15-2014-000796

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Entangled active matter: from ants to living cells[1]

FRANCOISE BROCHARD-WYART, Institut Curie

We introduce the field of "Entangled Active Matter" where the building blocks are transiently bound. We will point out strong similarities between aggregates of ants and cells! We will use multicellular aggregates, a model system for tissues. We characterize the tissue mechanical properties using pipette aspiration technique. The aggregate exhibits a viscoelastic response. We observe aggregate reinforcement with pressure, which may results in pulsed contractions or "shivering." We interpret this reinforcement as a mechano-sensitive active response of the acto-myosin cortex. We describe the spreading of aggregates on rigid and soft substrates, varying both intercellular and substrate adhesion. We find both partial and complete wetting, with a precursor film forming a cellular monolayer in a liquid or gas phase. We model the dynamics of spreading from a balance between active cellular driving forces and permeation of cells to enter into the film. Finally we study the motility of aggregates induced by chemical or rigidity gradients, or spontaneous: on soft substrate, the precursor film is unstable, leading to a symmetry breaking and a global motion of the aggregate. We describe the shapes of migrating aggregates, the flow and the force field responsible of the motion. We monitored the center of mass motion and we characterize the stick-slip motions.

[1]LABEX CelTisPhyBio, Institut Curie, France