

Liquid Crystal Facility (LCF) – Bulk

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Customers/Adaptors: Lightweight materials science, smart self-organizing materials, configurable opto-magnetic shielding

Objective:

- Studies of liquid crystal nucleation and growth, and kinetics of gelation phase separation at different temperatures. Control growth of the liquid crystal phases with temperature gradient system. Investigation of the internal field control of the self assembly colloidal disks applied electric field.
- Study of ferromagnetic fluid phases and crystallization of magnetic nanoplates in colloidal suspensions manifesting distinctive magnetic interaction effects with externally modulated magnetic field.

Experimental Approach:

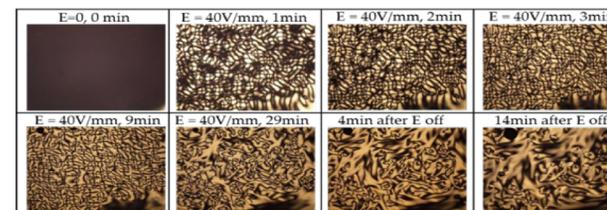
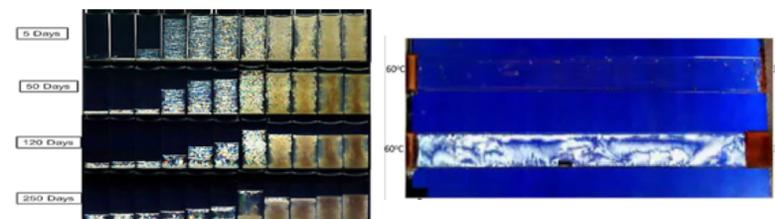
- Study bulk liquid crystals in several samples
- Control variables: Sample Concentrations (Material properties), Magnetic Field (0-100G, 0-1000 Hz), Temperature (0-90C), Electric Field (90V, 0-10 kHz)
- Diagnostics: Microscopic video (30 fps), Environmental sensor data

Relevance/Impact:

- TA - 12.1.1.3: Liquid crystal based composite materials for smart materials.
- TA - 12.1.3.3: Rational design of high performance liquid crystal smart materials
- TA - 12.1.5.1: Micro electronic devices of nano and microstructure fabrication for advanced opto electronics.

Project Development Approach:

- EM and Flight Unit approach – OASIS ground unit as a pre-build form/fit
- Science Definition Team with two types of experiments: Bulk and Bubble
- Developed, integrated, and operated by contractor under SpaceDoc.



Sedimentation effects due to gravity in nanoplates (top left). Thermal gradient experiment (top right). Electric field ordering and relaxation (below).

ISS Resource Requirements

Accommodation (carrier)	Microgravity Science Glovebox (MSG)
Upmass (kg) (w/o packing factor)	85 kg
Volume (m³) (w/o packing factor)	0.07
Power (kw) (peak)	0.650
Crew Time (hrs) (installation/operations)	14
Autonomous Operation	920 hours
Launch/Increment	Inc 68/69

Award	SCR	RDR	PDR	CDR	FHA	Ops
2013 7/20/2016	4/24/2017	9/6/2018	8/20/2019	9/20/2020	4/2021	1-2 Q FY22