Fiscal Year:	FY 2019	**Task Last Updated:**	FY 01/21/2020
PI Name:	Khusid, Boris Ph.D.		
Project Title:	Advanced Colloids Experiment-Temperature and Gradient Control (ACET11)		
Division Name:	Physical Sciences		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	COMPLEX FLUIDS/SOFT MATTER--Complex Fluids		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Newark	**State:**	NJ
Zip Code:	07102-1982	**Congressional District:**	10
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	2013 Complex Fluids & Macromolecular Biophysics NNH13ZTT001N
Start Date:	09/01/2019	**End Date:**	08/31/2021
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA GRC
Contact Monitor:	McQuillen, John	**Contact Phone:**	216-433-2876
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Chaikin, Paul Ph.D. (New York University) Hollingsworth, Andrew Ph.D. (New York University)		
Grant/Contract No.:	80NSSC19K1655		
Performance Goal No.:			
Performance Goal Text:			
	NOTE 1/21/2020: Continuation of "Kinetics of Electric Field-Driven Phase Transitions in Polarized Colloids," grant NNX13AQ53G, with same Principal Investigator Dr. Boris Khusid. Motivation: The widespread use of colloidal processes for scalable manufacturing of structured materials emphasizes a critical need for improving fundamental understanding of the role of external fields in directing non-equilibrium phenomena in suspensions. The challenge is due to kinetic limitations because the particles can be trapped into metastable configurations for a long time due to the lower mobility of multi-particle structures compared to that of individual particles. Microgravity offers a unique opportunity to study these phenomena by removing masking gravity effects, such as particle sedimentation, convection and jamming. The proposed research addresses both fundamental and technological questions in the science of colloids aimed at understanding the equilibrium and metastable crystalline,		

Task Description:	liquid, and glassy structures and the use of these materials in additive manufacturing. Objectives: Conduct tests in the International Space Station (ISS) Advanced Colloids Experiment (ACE) facility to elucidate the mechanisms of non-equilibrium phenomena underlying the assembly of colloidal particles assisted by temperature field gradients and suggest novel routes for processing functional materials. Methodology: A novel approach will be used to study mechanisms for formation of metastable and glassy phases in suspensions in the ISS and for comparison on Earth. A single sample will be exposed to a temperature gradient to cover the interesting range of particle densities. As the particle density is directly measured by microscopy, a priori knowledge of the gradient profile is not required. Experiments will involve setting up a temperature gradient to observe the resulting structures and then locally mix a region of known density to watch it glassify or crystallize. Quantitative data on the suspension rheology will come from microrheology measurements through tracking particle thermal motion. Deliverables: Understanding of non-equilibrium phenomena in colloids driven by temperature gradients and experimental database for the control and manipulation of colloidal structures in space and terrestrial applications.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Understanding of non-equilibrium phenomena in colloids driven by temperature gradients and experimental database for the control and manipulation of colloidal structures in space and terrestrial applications.
Task Progress:	New project for FY2019. NOTE 1/21/2020: Continuation of "Kinetics of Electric Field-Driven Phase Transitions in Polarized Colloids," grant NNX13AQ53G, with same Principal Investigator Dr. Boris Khusid. See that project for previous reporting.
Bibliography Type:	Description: (Last Updated: 09/17/2023)