Signature Page for
Microgravity Science and Application Division
Science Requirements for GBX STS-120

Title of Experiment:	**InSPACE-2: Structural and Rheological Transitions of Field-Responsive Fluids in Microgravity.**
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Eric M. Furst **Glovebox Investigator** Dept. Chemical Engineering, University of Delaware Newark, DE 19716	Signature	10/5/07 Date

CONCURRENCES
NASA-Glenn Research Center

Juan Agui **Project Scientist**	Signature	10/10/07 Date
Donna Bohman **Project Manager**	Signature	10/10/07 Date
Fred J. Kohl **ISS Research Project Manager**	Signature	10/10/07 Date
Francis P. Chiaramonte **ISS Research Project** **Program Executive, NASA HQ**	Signature	10/15/07 Date

Science Requirements for GBX Investigation

InSPACE-2

Objective

- To understand the field-induced kinetics of aggregation, percolation transition and pulsed-field behavior of magnetorheological (MR) suspensions.

Measurement Requirements

- Shake vials to obtain well-dispersed samples with a uniform rust-like color and no obvious sediments.
- Samples to be inserted in the "RT" (right view) mode, with the flat face of the capillary facing perpendicular to the axis of the Helmholtz coils.
- Upon insertion into coils, image of sample should look uniform with no obvious regions of high or low concentration.
- Focus in the middle of the sample chamber. This should be located by first focusing on the sample walls and selecting a point half way between.
- Impose a continuous field for 20 minutes with field strength according to test matrix.
- Impose a pulsed field at the same field strength for the remaining period of the test (40 minutes) with frequency according to test matrix.

Data Collection

- Video capture of evolution of structures in the MR fluid. Images should be illuminated as uniformly as possible and free from imaging defects caused by smudges, defects, scratches, etc. on the capillary walls.
- Videocassettes labeled with corresponding experimental conditions (field strength and volume fraction). Deviations from the test matrix will be noted.
- Field strength (in terms of coil current in amps) and frequency of the magnetic filed should be recorded.

Test Matrix

- The InSPACE-2 experiment consists of 4 samples with increasing particle concentration (0.40, 0.48, 0.57 and 0.65%) as illustrated in table 1. The kinetics of aggregation will be characterized for the first 20 minutes of the test under a constant field strength. After 20 minutes, the field will be switched to pulsed mode for the remaining 40 minutes.
- Four experimental runs highlighted in gray represent the minimum science return (each concentration at 1500 A/m and 10Hz). Twelve experimental runs include the other two field strengths (1000 and 2000 A/m) to achieve nomimal science success.
- Additional runs may be performed for full success. It is desirable to switch the view

desirable to investigate the kinetics of chain formation over longer times and field strengths of 1250 and 1750A/m in the "RT" view. The priorities for additional conditions will be determined based on preliminary analysis of the minimum science return.

Volume Fraction	Field Strength		Frequency	View
	H (A/m)	λ	Hz	
0.40%	1000	30	10	RT
	1500	68	10	RT
	2000	120	10	RT
0.48%	1000	30	10	RT
	1500	68	10	RT
	2000	120	10	RT
0.57%	1000	30	10	RT
	1500	68	10	RT
	2000	120	10	RT
0.65%	1000	30	10	RT
	1500	68	10	RT
	2000	120	10	RT

Table 1.

Post-Flight Data Deliverables for InSPACE-2

The following deliverables will be supplied by NASA to the GI for post flight analysis:

- Digital videocassettes of all the science video labelled according to test run, field strength and pulse frequency.
- Any other engineering parameters recorded or videotaped during the experiment are required.

Post-Flight Hardware Deliverables for InSPACE-2

- If possible, vial assemblies will be returned for analysis of the fluid in order to

determine whether any degradation of the sample has occurred (such as particle aggregation).

- The coils will remain for future samples.