Payloads for Material Science Aboard the ISS

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Innovate. Integrate. Inspire.

George Tipker

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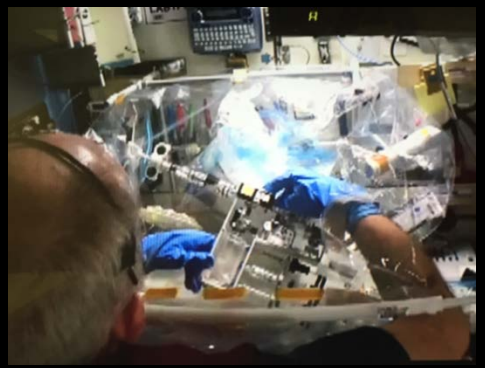
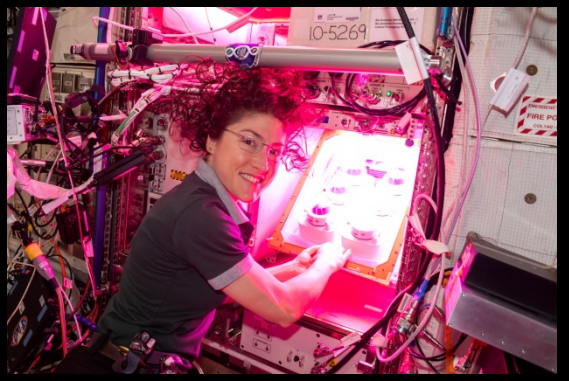
Developing and managing a wide variety of custom space research equipment for professional scientists for more than 30 years





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Locations

- Indiana (left) and the Kennedy Space Center

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Key NASA agreements

Space Act Agreement

- Operate commercially aboard the ISS, transportation, crew time

IDIQ

- Pre-negotiated pricing menu for hardware and services

REMIS

- CLINs: 1, research FFP; 2A, engineering FFP; 3, research CPFF; and 4, engineering, CPFF

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POCC (IN and FL)

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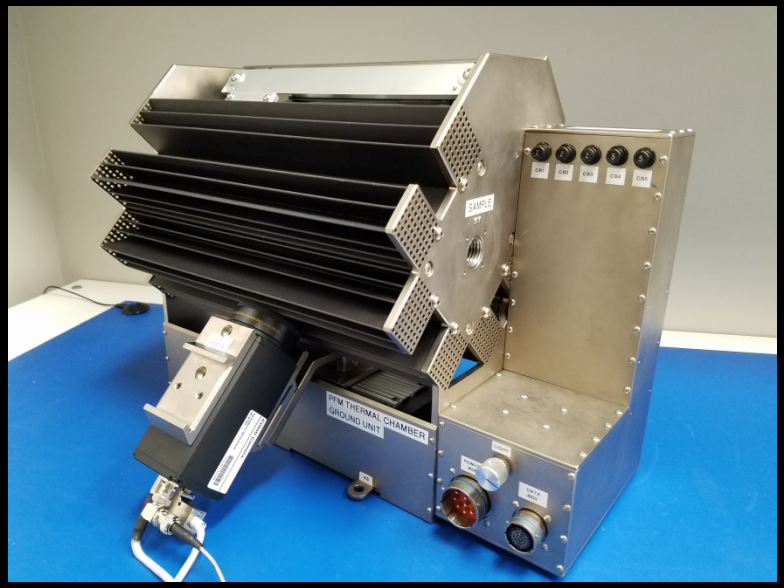
Material Science Hardware

PFMI

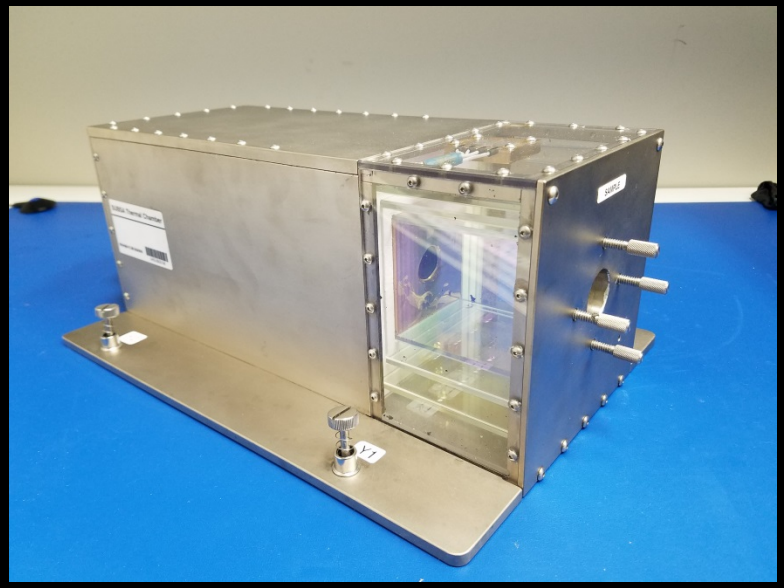
- Pore Formation and Mobility Investigation

SUBSA

- Solidification Using a Baffle in Sealed Ampoules



PFMI Thermal Chamber



SUBSA Thermal Chamber

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PFMI Furnace Capabilities

PFMI Furnace Capabilities & Critical Performance Parameters	
Type of Processing	Bridgman
*Max Thermal Gradient	Up to 50° C/min
Transparent Gradient Zone Length	2.5 cm to 0.5 cm, selectable
Max Sample Outer Diameter	10 mm
Max Sample Length	23 cm
*Max Sample Processing Length	12 cm
Max Heater Temperature	130° C
Cold Zone Min. Temperature	5° C
Heater Stability	+/- 1° C
Translation Velocity	0.5 micon/sec. to 100 micron/sec.
Translation Stability	+/- 5%
Sample Ampoule Dimensions	OD 12.75 mm, Length 28 cm
Sample Instrumentation	Up to 6 Type K Thermocouples on the inside of the ampoule
Temperature Data Recording Rate	Up to 1/sec
Video	Digital Video Recording @ 30fps, zoom 22:1, Two Cameras
Commanding	Remote commanding of heater/cold zone temp. & camera zoom/focus
*Depends on sample material & configuration	

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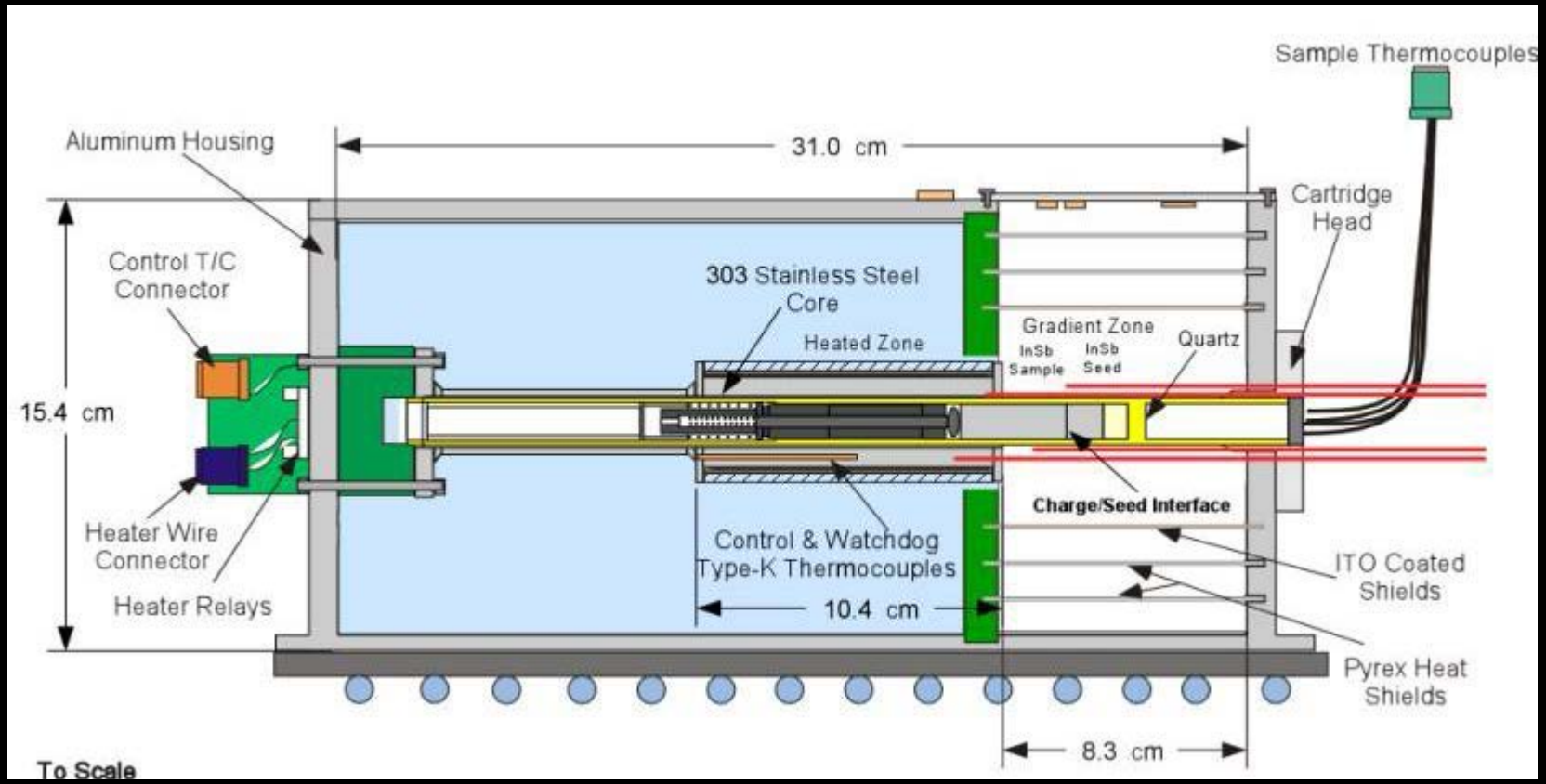
Solidification Using a Baffle in Sealed Ampoules



Cross Section of SUBSA Thermal Chamber

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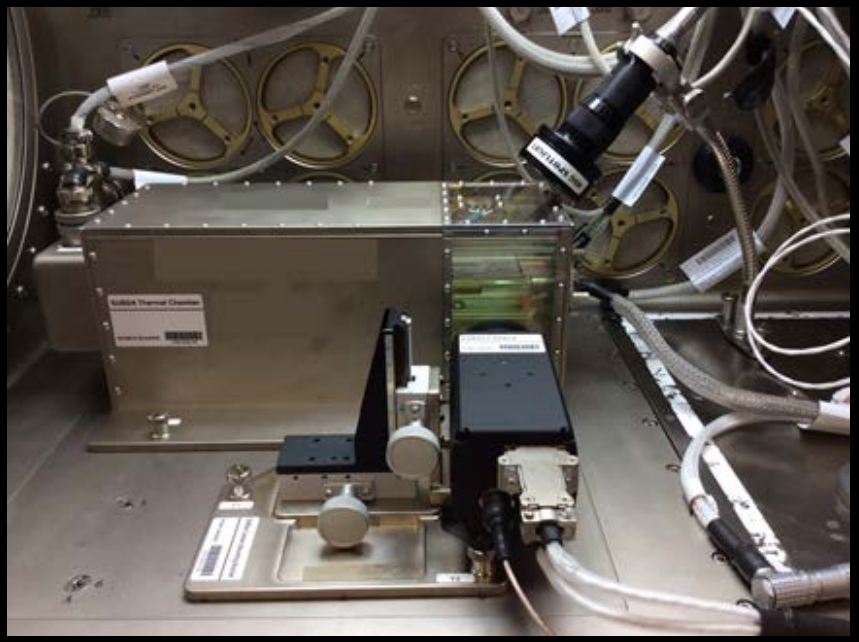
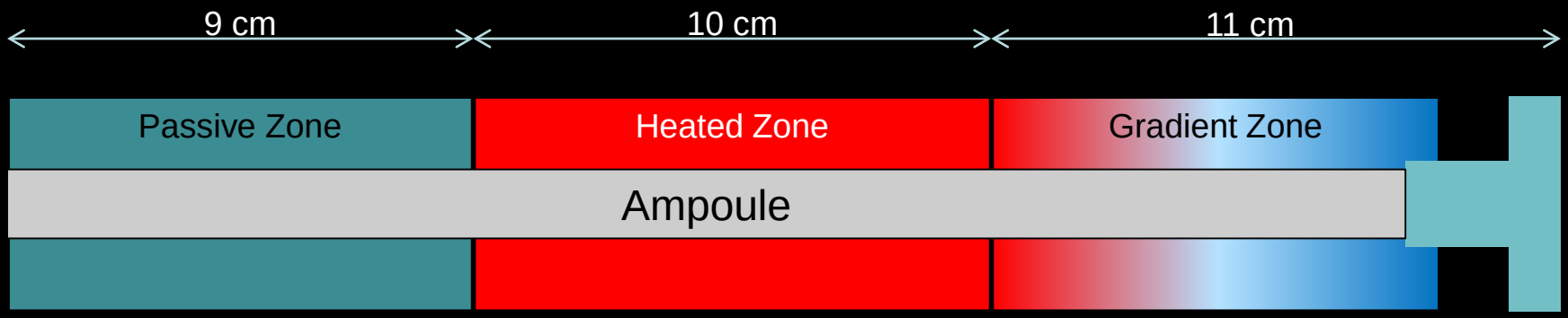
SUBSA Furnace Overview



- Max Temp: 850 °C
- 10 cm Heated Zone
- 9 cm Passive Zone



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SUBSA Furnace Capabilities

SUBSA Furnace Capabilities & Critical Performance Parameters	
Type of Processing	Gradient Freeze
Min. Cool-down Rate	0.5°C/min
*Max Thermal Gradient	Up to 110°C/cm
Transparent Gradient Zone Length	8 cm
Max Sample Outer Diameter	12 mm
Max Sample Length	30 cm
*Max Sample Processing Length	13 cm
Max Heater Temperature	850°C
Heater Stability Control	+/- 0.15°C
Sample Ampoule Dimensions	OD 16 mm, Length 30 cm
Sample Instrumentation	Up to 4 Type K Thermocouples on the outside of the ampoule
Temperature Data Recoding Rate	Up to 1/sec
Video	Digital Video Recording @ 30fps, zoom 22:1, One Camera
Commanding	Remote commanding of heater temp. & camera zoom/focus
*Depends on sample material & configuration	

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SUBSA Experiments

Convection-free synthesis of 2D nanomaterials on the ISS for improved radiation detection.

- Hypothesize that convection-free synthesis will result in samples with greater crystallinity.
- Vapor deposition at elevated temperatures.

Columnar-to-equiaxed Transition (CETSOL).

- Study columnar-to-equiaxed grain structure transition and the effect of convection in alloys.
- Study with and without grain refiner.

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Questions or Slide Requests?

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