Task Book Report Generated on: 11/08/2024

Pi Name: Duanad, David Ph.D. Project Title: Microstructure Evolution in Freeze-Cast Materials Division Name: Physical Sciences Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline: MATERIALS SCIENCEMaterials science Joint Agency Name: TechPort: No Human Research Program Elements: None Human Research Program Elements: None Space Biology Element: None Space Biology Special Category: None PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Materials Lab Open Science Campus Sprey Source Campus Sprey Fermione to International Space Station Start Date: 11/06/2017 End Date: 11/06/2023 No. of Post Does: No. of PDD Degrees: No. of PDD Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: Monitoring Center: NASA MSFC	Fiscal Year:	FY 2018	Task Last Updated:	FY 01/11/2018
Project Title: Microstructure Evolution in Freeze-Cast Materials Division Name: Physical Sciences Program/Discipline: Program/Discipline: Program/Discipline: Division Agency Name: TechPort: No Human Research Program Elements: None Human Research Program Risks: None Human Research Program Risks: None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: dunand@nonthwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: L Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Materials Age Station Source: Campaigns for Experiments on International Space Station Start Date: 11.06/2017 End Date: 11.05/2023 No. of PbD Candidates: No. of Master's Degrees: No. of Master's De			Zuon Duot o punttui	
Division Name: Physical Sciences Program/Discipline: Program/Discipline- Element/Subdiscipline: 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 PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Materials Lab Open Science Source: Campaigns for Experiments on International Space Station Start Date: 11/08/2023 No. of Post Does: No. of PhD Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Candidates: No.				
Program/Discipline: Program/Discipline- Element/Subdiscipline: Joint Agency Name: None Human Research Program Elements: None Space Biology Element: None Space Biology Special Category: None PI Email: dunand/@northwestern.edu PI Organization Type: UNIVERSITY Pl Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston Source Flight Solicitation / Funding Source Campuigns for Experiments Other Discretes Source Solicitation / Funding Materials Lab Open Science Campuigns for Experiments Other Discretes Source Solicitation / Funding Materials Lab Open Science Campuigns for Experiments Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Does: No. of Master's Candidates:	110,000 1100	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		
Program/Discipline— Element/Subdiscipline: Blement/Subdiscipline: Joint Agency Name: None Human Research Program Elements: None Human Research Program Risks: None Space Biology Element: None Space Biology Special Category: None PI Email: dunand/morthwestern edu Fax: FY Pl Organization Type: UNIVERSITY None Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive/ Cook Hall PI Web Page: City: Evanston State: L Zip Code: 60208 Congressional District: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of Eard Date: No. of PhD Degrees: No. of PhD Degrees: No. of PhD Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Bachelor's Degrees: No. of Bachelor's Degrees:	Division Name:	Physical Sciences		
Element/Subdiscipline: Joint Agency Name: TechPort: No Human Research Program Elements: None Human Research Program Risks: None Space Biology Element: None Space Biology Cross-Element Space Biology Special Category: None PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Materials Lab Open Science Source: Campaigns for Experiments on International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of PhD Degrees: No. of Master' Degree	Program/Discipline:			
Human Research Program Elements: None Human Research Program Risks: None Space Biology Cross-Element Discipline: None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: dunand@northwestem.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source Campus for Experiments on International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master' Degrees: No. of Bachelor's Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Spegrees:		MATERIALS SCIENCEMaterials science		
Human Research Program Risks: None Space Biology Element: None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: dunand@northwestem.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campus for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master' Spegrees: No. of Master's Candidates: No. of Master' Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Candidates: No. of Ma	Joint Agency Name:		TechPort:	No
Space Biology Element: None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Materials.l.ab Open Science Campaigns for Experiments of International Space Station of Start Date: 11/05/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	Human Research Program Elements:	None		
Space Biology Cross-Element Discipline: Space Biology Special Category: None PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: L Zip Code: 60208 Congressional District: Project Type: Flight Solicitation / Funding Materials Lab Open Science Source: Campaigns for Experiments of International Space Station of State: Start Date: 11/06/2017 End Date: 11/05/2023 No. of PbD Candidates: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Degrees:	Human Research Program Risks:	None		
Discipline: Space Biology Special Category: None PI Email: dunand@northwestern.edu PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments or International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master's Degrees:	Space Biology Element:	None		
PI Email: dunand@northwestern.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:		None		
PI Organization Type: UNIVERSITY Phone: 847-491-5370 Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding MaterialsLab Open Science Campaigns for Experiments of International Space Station of Post Docs: No. of Post Docs: No. of PhD Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	Space Biology Special Category:	None		
Organization Name: Northwestern University PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station of Post Docs: No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Master's Degrees:	PI Email:	dunand@northwestern.edu	Fax:	FY
PI Address 1: Materials Science and Engineering PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments or International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	PI Organization Type:	UNIVERSITY	Phone:	847-491-5370
PI Address 2: Campus Drive / Cook Hall PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments or International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	Organization Name:	Northwestern University		
PI Web Page: City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	PI Address 1:	Materials Science and Engineering		
City: Evanston State: IL Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	PI Address 2:	Campus Drive / Cook Hall		
Zip Code: 60208 Congressional District: 9 Comments: Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	PI Web Page:			
Comments: Project Type: Flight Solicitation / Funding Source: Flight Solicitation / Funding Source: End Date: 11/06/2017 End Date: 11/05/2023 No. of PhD Candidates: No. of Master's Candidates: No. of Master's Degrees: No. of Bachelor's Degrees:	City:	Evanston	State:	IL
Project Type: Flight Solicitation / Funding Source: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of PhD Degrees: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees:	Zip Code:	60208	Congressional District:	9
Project Type: Flight Solicitation / Funding Source: Campaigns for Experiments of International Space Station Start Date: 11/06/2017 End Date: 11/05/2023 No. of PhD Candidates: No. of Master's Candidates: No. of Master's Degrees: No. of Bachelor's Degrees:	Comments:			
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:	Project Type:	Flight	Solicitation / Funding Source:	MaterialsLab Open Science Campaigns for Experiments on the
No. of PhD Candidates: No. of Master's Candidates: No. of Master's Degrees:	Start Date:	11/06/2017	End Date:	11/05/2023
No. of Master's Candidates: No. of Bachelor's Degrees:	No. of Post Docs:		No. of PhD Degrees:	
	No. of PhD Candidates:		No. of Master' Degrees:	
No. of Bachelor's Candidates: Monitoring Center: NASA MSFC	No. of Master's Candidates:		No. of Bachelor's Degrees:	
	No. of Bachelor's Candidates:		Monitoring Center:	NASA MSFC
Contact Monitor: Rogers, Jan Contact Phone: 256.544.1081	Contact Monitor:	Rogers, Jan	Contact Phone:	256.544.1081
Contact Email: jan.r.rogers@nasa.gov	Contact Email:	jan.r.rogers@nasa.gov		
Flight Program: ISS	Flight Program:	ISS		
Flight Assignment:	Flight Assignment:			
Key Personnel Changes/Previous PI:	Key Personnel Changes/Previous PI:			
COI Name (Institution): Voorhees, Peter Ph.D. (Northwestern University)	COI Name (Institution):	Voorhees, Peter Ph.D. (Northwestern University)		
Grant/Contract No.: 80NSSC18K0196	Grant/Contract No.:	80NSSC18K0196		
Performance Goal No.:	Performance Goal No.:			
Performance Goal Text:	Performance Goal Text:			

Task Book Report Generated on: 11/08/2024

Freeze-casting is a novel technique that utilizes ice as a fugitive space holder to fabricate a diverse variety of materials exhibiting elongated, aligned pores. Experimental studies in microgravity inherently simplify the freeze-casting system by minimizing gravity-induced forces that contribute to its complexity, e.g.. sedimentation, buoyancy, and natural convection. Freeze-casting has the potential to produce porous products with specific microstructure including net- and complex-shaped products, provided solidification conditions are properly controlled. Moreover, freeze-casting holds **Task Description:** significant promise as an in situ resource utilization technique for space-based materials processing, thus increasing the reliability and safety of access to space while also decreasing overall costs. An improvement in scientific knowledge entails robust and predictive control of materials for a wide variety of applications, thus enabling optimized fabrication on Earth, on planetary surfaces (Moon and Mars), and in orbit. **Rationale for HRP Directed Research:** Freeze-casting has the potential to produce porous products with specific microstructure including net- and complex-shaped products, provided solidification conditions are properly controlled. Moreover, freeze-casting holds significant promise as an in situ resource utilization technique for space-based materials processing, thus increasing the Research Impact/Earth Benefits: reliability and safety of access to space while also decreasing overall costs. An improvement in scientific knowledge entails robust and predictive control of materials for a wide variety of applications, thus enabling optimized fabrication on Earth, on planetary surfaces (Moon and Mars), and in orbit. New project for FY2018. Task Progress: **Bibliography Type:** Description: (Last Updated: 09/30/2024)

Page 2 of 2