Universitatea Transilvania din Brașov

Interdisciplinary Doctoral School

ADMISSION TO DOCTORAL STUDIES Session September 2022

Field of doctoral studies: Mechanical Engineering
Doctoral supervisor: Prof. dr. ing. NĂSTASE Gabriel

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: Study of thermodynamic profiles for some substances used in food preservation in isochoric systems
Content / Main aspects to be considered *Food preservation in isobaric and isochoric systems* *Thermodynamic analysis methods* *Experimental evaluation of cryoprotectants* *Cryoprotective agents in the food industry*
Recommended bibliography: 1. Gabriel Năstase, Pedro Alejandro PEREZ, Alexandru ȘERBAN*, Alexandru DOBROVICESCU, Mariana-Florentina ȘTEFĂNESCU and Boris RUBINSKY - Advantages of isochoric freezing for food preservation: a preliminary analysis, International Communications in Heat and Mass Transfer, ISSN: 0735-1933, 78 (2016) pp. 95-100, 10.1016/j.icheatmasstransfer.2016.08.026 2. H. Mikus, A. Miller, G. Nastase*, A. Serban, M. Shapira, and B. Rubinsky, "The nematode Caenorhabditis elegans survives subfreezing temperatures in an isochoric system," Biochem. Biophys. Res. Commun., vol. 477, no. 3, pp. 401–405, 2016, ISSN: 0006-291X. 3. Chenang Lyu, Gabriel Năstase*, Gideon Ukpai, Alexandru Şerban and Boris Rubinsky, "A comparison of freezing-damage during isochoric and isobaric freezing of the potato", PeerJ, 2017, DOI 10.7717/peerj.3322, ISSN: 2167-8359 4. Gabriel Năstase*, Chenang Lyu, Gideon Ukpai, Alexandru Şerban and Boris Rubinsky "Isochoric and isobaric freezing of fish muscle" Biochem. Biophys. Res. Commun., vol. 485, no. 2, pp. 279–283, 2017, ISSN: 0006-291X. 5. G.-A. Beşchea, Ş.-I. Câmpean, M.-B. Tăbăcaru, A. Şerban, B. Rubinsky, and G. Năstase, "Biochemical and Biophysical Research Communications Glucose and glycerol temperature-pressure correlations for the design of cryopreservation protocols in an isochoric system at subfreezing temperature," Biochem. Biophys. Res. Commun., vol. 559, pp. 42–47, 2021, doi: 10.1016/j.bbrc.2021.04.084. 6. Ștefan-I. Câmpean, G.-A. Beșchea, A. Șerban, M. J. Powell-Palm, B. Rubinsky, and **G. Năstase**, "Analysis of the relative supercooling enhancement of two emerging supercooling techniques," *AIP Adv.*, vol. 11, no. 5, p. 55125, May 2021, doi: 10.1063/5.0051662. 7. J. A. Preciado and B. Rubinsky, "Isochoric preservation: A novel characterization method," Cryobiology, vol. 60, no. 1, pp. 23–29, 2010, doi: 10.1016/j.cryobiol.2009.06.010. 8. B. Rubinsky, P. A. Perez, and M. E. Carlson, "The thermodynamic principles of isochoric cryopreservation.," Cryobiology, vol. 50, no. 2, pp. 121–38, Apr. 2005, doi:

10.1016/j.cryobiol.2004.12.002.
9. S. A. Szobota and B. Rubinsky, "Analysis of isochoric subcooling," Cryobiology, vol. 53, no. 1, pp. 139–142, 2006, doi: 10.1016/j.cryobiol.2006.04.001.
10. A. Azimi Yancheshme, G. Momen, and R. Jafari Aminabadi, "Mechanisms of ice formation and propagation on superhydrophobic surfaces: A review," Adv. Colloid Interface Sci., vol. 279, p. 102155, 2020, doi: 10.1016/j.cis.2020.102155.
11. D. E. Pegg, "The relevance of ice crystal formation for the cryopreservation of tissues and organs," Cryobiology, vol. 93, no. November 2009, pp. 3–11, 2020, doi: 10.1016/j.cryobiol.2020.01.005.
12. M. J. Powell-Palm and B. Rubinsky, "A shift from the isobaric to the isochoric thermodynamic state can reduce energy consumption and augment temperature stability in frozen food storage," J. Food Eng., vol. 251, no. February, pp. 1–10, 2019, doi: 10.1016/j.jfoodeng.2019.02.001.

Prerequisites / Remarks: *It's not necessary*

TOPIC 2: *Use of renewable energy in buildings*

Content / Main aspects to be considered
Use of refrigeration machines as a heat pump
Low temperature radiative systems used in buildings
Coupling of heat pumps with low temperature radiative systems
Heat pumps with natural working (refrigerating) agents

Recommended bibliography:

1. G. Dragomir, A. Șerban*, G. Năstase, and A. I. Brezeanu, "Wind energy in Romania: A review from 2009 to 2016," Renew. Sustain. Energy Rev., vol. 64, pp. 129–143, 2016, ISSN: 1364-0321.
2. G. Năstase*, A. Șerban, G. Dragomir, S. Bolocan, and A. I. Brezeanu, "Box window double skin façade. Steady state heat transfer model proposal for energetic audits," Energy Build., vol. 112, pp. 12–20, Jan. 2016, ISSN: 0378-7788.
3. G. Năstase*, A. Șerban, A. F. Năstase, G. Dragomir, A. I. Brezeanu and N. Ioardan, "Hydropower development in Romania. A review from its beginning to the present", Renew. Sustain. Energy Rev., vol. 80, pp. 297–312, 2017, ISSN: 1364-0321.
4. Gabriel Năstase*, Alexandru Șerban*, Alina Florentina Năstase, George Dragomir, Alin Ionuț Brezeanu "Air quality, primary air pollutants and ambient concentration inventory for Romania", Atmospheric Environment, vol.184C, 2018, pp.292-303, ISSN: 1352-2310
5. G. Năstase*, A. Șerban*, G. Dragomir, A. I. Brezeanu and I. Bucur, "Photovoltaic development in Romania. Reviewing what has been done", Renew. Sustain. Energy Rev., vol. 94, pp. 523–535, 2018, ISSN: 1364-0321.

Prerequisites / Remarks: *It's not necessary*

TOPIC 3: *Study of facades with dynamic geometry made of composite materials and vacuum bags*

Content / Main aspects to be considered
Facades with dynamic geometry
Composite materials and vacuum bags
Passive elements of energy efficiency
Intelligent systems
3D printed materials

Recommended bibliography:

1. G. Năstase*, A. Şerban, G. Dragomir, S. Bolocan, and A. I. Brezeanu, "Box window double skin façade. Steady state heat transfer model proposal for energetic audits," Energy Build., vol. 112, pp. 12–20, Jan. 2016, ISSN: 0378-7788.
2. G. Dragomir, A. Şerban*, G. Năstase, and A. I. Brezeanu, "Wind energy in Romania: A review from 2009 to 2016," Renew. Sustain. Energy Rev., vol. 64, pp. 129–143, 2016, ISSN: 1364-0321.
3. G. Năstase*, A. Şerban, A. F. Năstase, G. Dragomir, A. I. Brezeanu and N. Ioardan, "Hydropower development in Romania. A review from its beginning to the present", Renew. Sustain. Energy Rev., vol. 80, pp. 297–312, 2017, ISSN: 1364-0321.
4. Gabriel Năstase*, Alexandru Şerban*, Alina Florentina Năstase, George Dragomir, Alin Ionuţ Brezeanu "Air quality, primary air pollutants and ambient concentration inventory for Romania", Atmospheric Environment, vol.184C, 2018, pp.292-303, ISSN: 1352-2310
5. G. Năstase*, A. Şerban*, G. Dragomir, A. I. Brezeanu and I. Bucur, "Photovoltaic development in Romania. Reviewing what has been done", Renew. Sustain. Energy Rev., vol. 94, pp. 523–535, 2018, ISSN: 1364-0321.

Prerequisites / Remarks: *It's not necessary*

TOPIC 4: *Experimental research on intelligent facades made of 3D printed composite materials*

Content / Main aspects to be considered

Facades with dynamic geometry
Composite materials and vacuum bags
Passive elements of energy efficiency
Intelligent systems
3D printed materials

Recommended bibliography:

1. G. Năstase*, A. Şerban, G. Dragomir, S. Bolocan, and A. I. Brezeanu, "Box window double skin façade. Steady state heat transfer model proposal for energetic audits," Energy Build., vol. 112, pp. 12–20, Jan. 2016, ISSN: 0378-7788.
2. G. Dragomir, A. Şerban*, G. Năstase, and A. I. Brezeanu, "Wind energy in Romania: A review from 2009 to 2016," Renew. Sustain. Energy Rev., vol. 64, pp. 129–143, 2016, ISSN: 1364-0321.
3. G. Năstase*, A. Şerban, A. F. Năstase, G. Dragomir, A. I. Brezeanu and N. Ioardan, "Hydropower development in Romania. A review from its beginning to the present", Renew. Sustain. Energy Rev., vol. 80, pp. 297–312, 2017, ISSN: 1364-0321.
4. Gabriel Năstase*, Alexandru Şerban*, Alina Florentina Năstase, George Dragomir, Alin Ionuţ Brezeanu "Air quality, primary air pollutants and ambient concentration inventory for Romania", Atmospheric Environment, vol.184C, 2018, pp.292-303, ISSN: 1352-2310
5. G. Năstase*, A. Şerban*, G. Dragomir, A. I. Brezeanu and I. Bucur, "Photovoltaic development in Romania. Reviewing what has been done", Renew. Sustain. Energy Rev., vol. 94, pp. 523–535, 2018, ISSN: 1364-0321.

Prerequisites / Remarks: *It's not necessary*

TOPIC 5: *Experimental research on facades made of 3D printed composite materials*

Content / Main aspects to be considered

Facades with dynamic geometry
Composite materials and vacuum bags
Passive elements of energy efficiency
Intelligent systems
3D printed materials

Recommended bibliography:

1. G. Năstase*, A. Şerban, G. Dragomir, S. Bolocan, and A. I. Brezeanu, "Box window double skin façade. Steady state heat transfer model proposal for energetic audits," Energy Build., vol. 112, pp. 12–20, Jan. 2016, ISSN: 0378-7788.
2. G. Dragomir, A. Şerban*, G. Năstase, and A. I. Brezeanu, "Wind energy in Romania: A review from 2009 to 2016," Renew. Sustain. Energy Rev., vol. 64, pp. 129–143, 2016, ISSN: 1364-0321.
3. G. Năstase*, A. Şerban, A. F. Năstase, G. Dragomir, A. I. Brezeanu and N. Ioardan, "Hydropower development in Romania. A review from its beginning to the present", Renew. Sustain. Energy Rev., vol. 80, pp. 297–312, 2017, ISSN: 1364-0321.
4. Gabriel Năstase*, Alexandru Şerban*, Alina Florentina Năstase, George Dragomir, Alin Ionuț Brezeanu "Air quality, primary air pollutants and ambient concentration inventory for Romania", Atmospheric Environment, vol.184C, 2018, pp.292-303, ISSN: 1352-2310
5. G. Năstase*, A. Şerban*, G. Dragomir, A. I. Brezeanu and I. Bucur, "Photovoltaic development in Romania. Reviewing what has been done", Renew. Sustain. Energy Rev., vol. 94, pp. 523–535, 2018, ISSN: 1364-0321.

Prerequisites / Remarks: *It's not necessary*

Doctoral supervisor,

Prof. Dr. eng. Năstase Gabriel

Signature

Coordinator of the field of doctoral studies,

Prof. Dr. eng. Vlase Sorin

Signature