

ADMISSION TO DOCTORAL STUDIES

Session September 2025

Field of doctoral studies: Mechanical Engineering

Doctoral supervisor: Prof. Eng. Gabriel NĂSTASE PhD.

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *The Influence of Geometry and Materials on Isochoric Nucleation*

Contents / Main aspects to be considered

The Mechanism of Ice Formation in Isobaric and Isochoric Systems

Types of Materials Used in Isochoric Reactors

The Influence of Geometry on Nucleation in Isochoric Systems

The Influence of Geometry and Material on Ice Propagation in Isochoric Systems

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. Gideon Ukpai, Gabriel Năstase*, Alexandru Șerban and Boris Rubinsky "Pressure in isochoric system containing aqueous solutions at subzero Centigrade temperatures" PLoS ONE, vol. 12, no. 8, pp. 1–16, 2017, ISSN: 1932-6203
3. G.-A. Beșchea, Ș.-I. Câmpăan, M.-B. Tăbăcaru, A. Șerban, 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.
4. Gabriel Năstase, Florin Botea, George-Andrei Beșchea, Ștefan-Ioan Câmpăan, Alexandru Barcu, Ion Neacșu, Vlad Herlea, Irinel Popescu, Tammy T. Chang, Boris Rubinsky and Alexandru Șerban (2023) - Isochoric Supercooling Organ Preservation System, Bioengineering 2023, 10, 934. <https://doi.org/10.3390/bioengineering10080934>
Alexandru Șerban, Gabriel Năstase, George-Andrei Beșchea, Ștefan-Ioan Câmpăan, Cătălin Fetecău, Irinel Popescu, Florin Botea, Ion Neacșu Front. Bioeng. Biotechnol., 07 March 2024 Sec. Bioprocess Engineering Volume 12 - 2024 | <https://doi.org/10.3389/fbioe.2024.1335638>
Prototype isochoric preservation device for large organs.

Prerequisites / Remarks: *Not applicable*

☒ Scientific Doctorate (full-time only)

☐ Professional Doctorate (full-time or part-time)

- ☒ without tuition fee (state budget funded)
- ☒ with tuition fee or with funding from other sources than the state budget

TOPIC 2: *Thermodynamic Study of Next-Generation Cryoprotectants under Isochoric Conditions*

Contents / Main aspects to be considered

Methods of Thermodynamic Analysis

Experimental Evaluation of Cryoprotective Agents

Next-Generation Cryoprotective Agents

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. Gideon Ukpai, Gabriel Năstase*, Alexandru Șerban and Boris Rubinsky "Pressure in isochoric system containing aqueous solutions at subzero Centigrade temperatures" PLoS ONE, vol. 12, no. 8, pp. 1–16, 2017, ISSN: 1932-6203
4. Botea, F., Năstase, G., Herlea, V., Chang, T. T., Șerban, A., Barcu, A., Rubinsky, B., & Popescu, I. (2023). An exploratory study on isochoric supercooling preservation of the pig liver. Biochemistry and Biophysics Reports, 34. <https://doi.org/10.1016/j.bbrep.2023.101485>
Gabriel Năstase, Florin Botea, George-Andrei Beșchea, Ștefan-Ioan Câmpean, Alexandru Barcu, Ion Neacșu, Vlad Herlea, Irinel Popescu, Tammy T. Chang, Boris Rubinsky and Alexandru Șerban (2023) - Isochoric Supercooling Organ Preservation System, Bioengineering 2023, 10, 934. <https://doi.org/10.3390/bioengineering10080934>

Prerequisites / Remarks: *Not applicable*

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- ☐ Professional Doctorate (full-time or part-time)

- ☒ without tuition fee (state budget funded)
- ☒ with tuition fee or with funding from other sources than the state budget

Doctoral supervisor,

Prof. Eng. Gabriel NĂSTASE PhD.

Signature

Coordinator of the field of doctoral studies,

Prof. Eng. Maria Luminița Scutaru PhD.

Signature