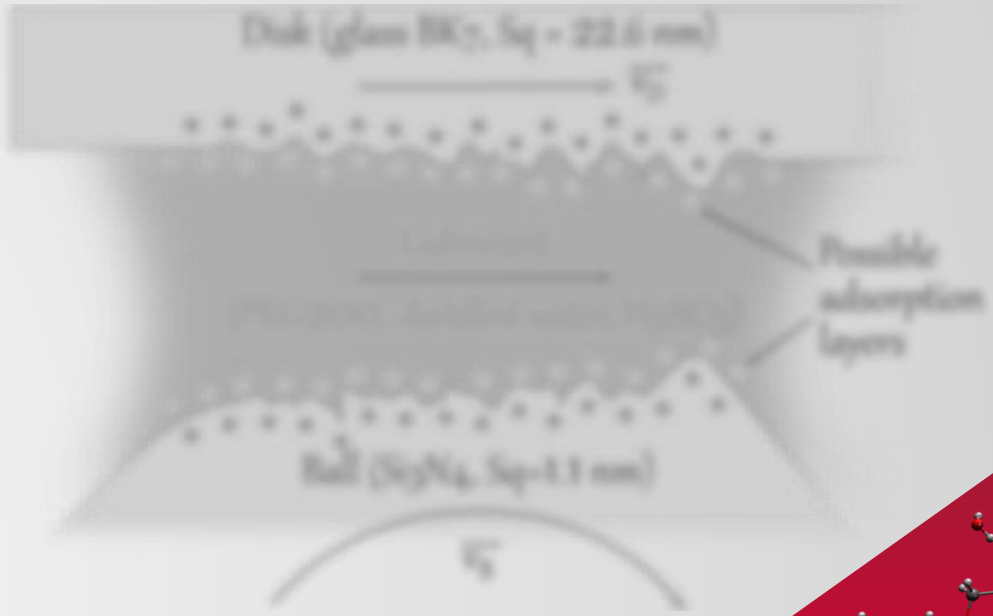
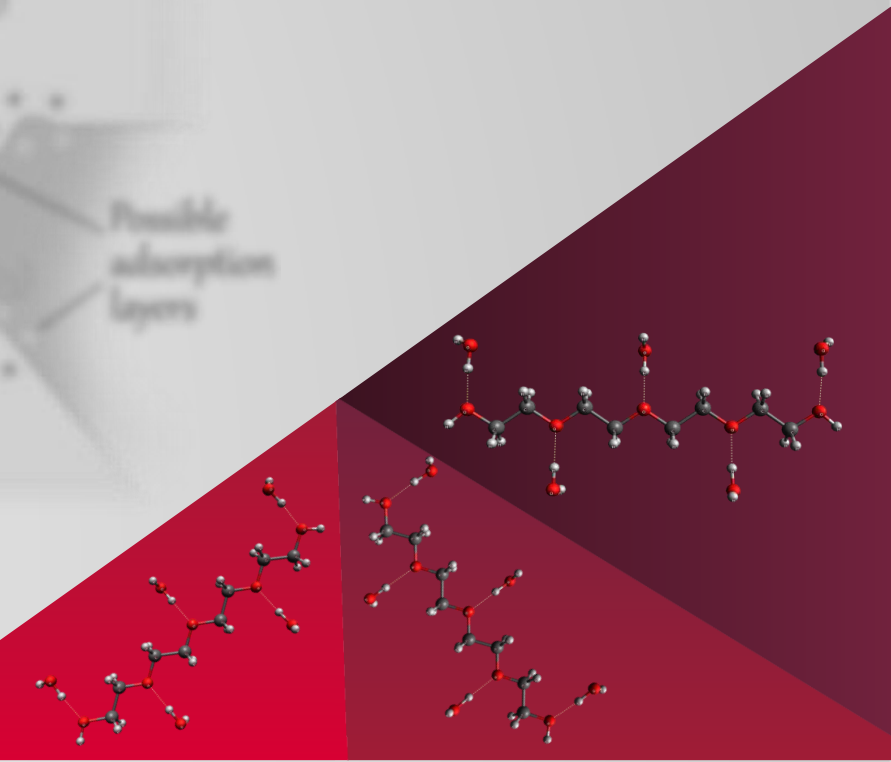
ACTIVITIES AT IMID

Tomáš Poláček, Ing. et Ing.

Institute of Machine and Industrial Design
Faculty of Mechanical Engineering
Brno University of Technology

Brno, 4. 6. 2025





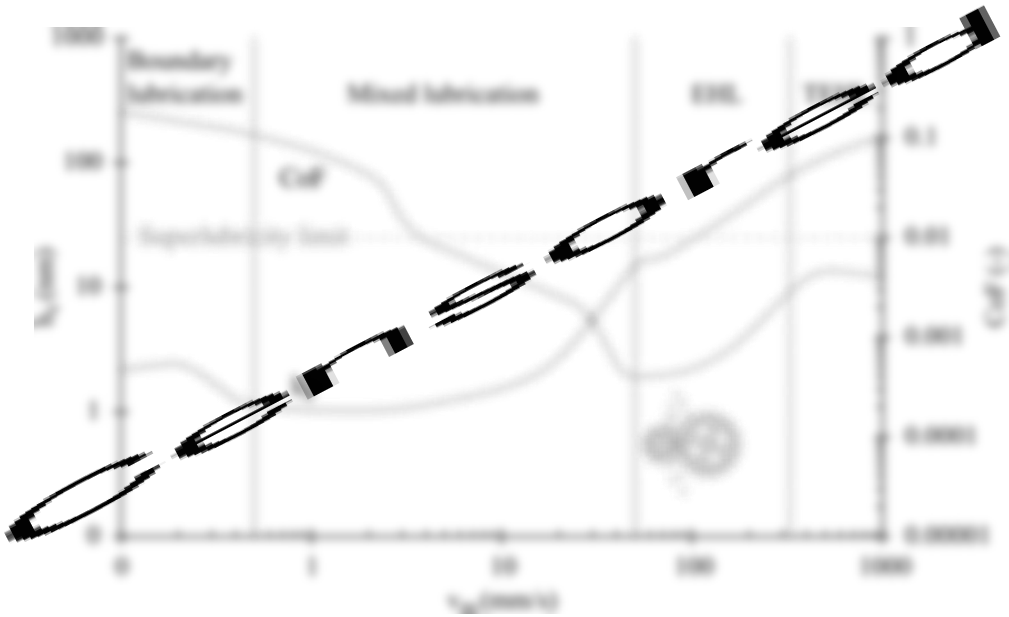
INSTITUTE OF **MACHINE**
AND **INDUSTRIAL DESIGN**

2021
-2025

PHD STUDY & RESEARCH

PhD study topic

- Mechanisms of superlubricity in liquid film contacts



Teaching

- 3CD, 4KC

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2021

PNEUMOBILE, PNEURACER

- Online competition
  - Pneumobile Team Leader
- MSV

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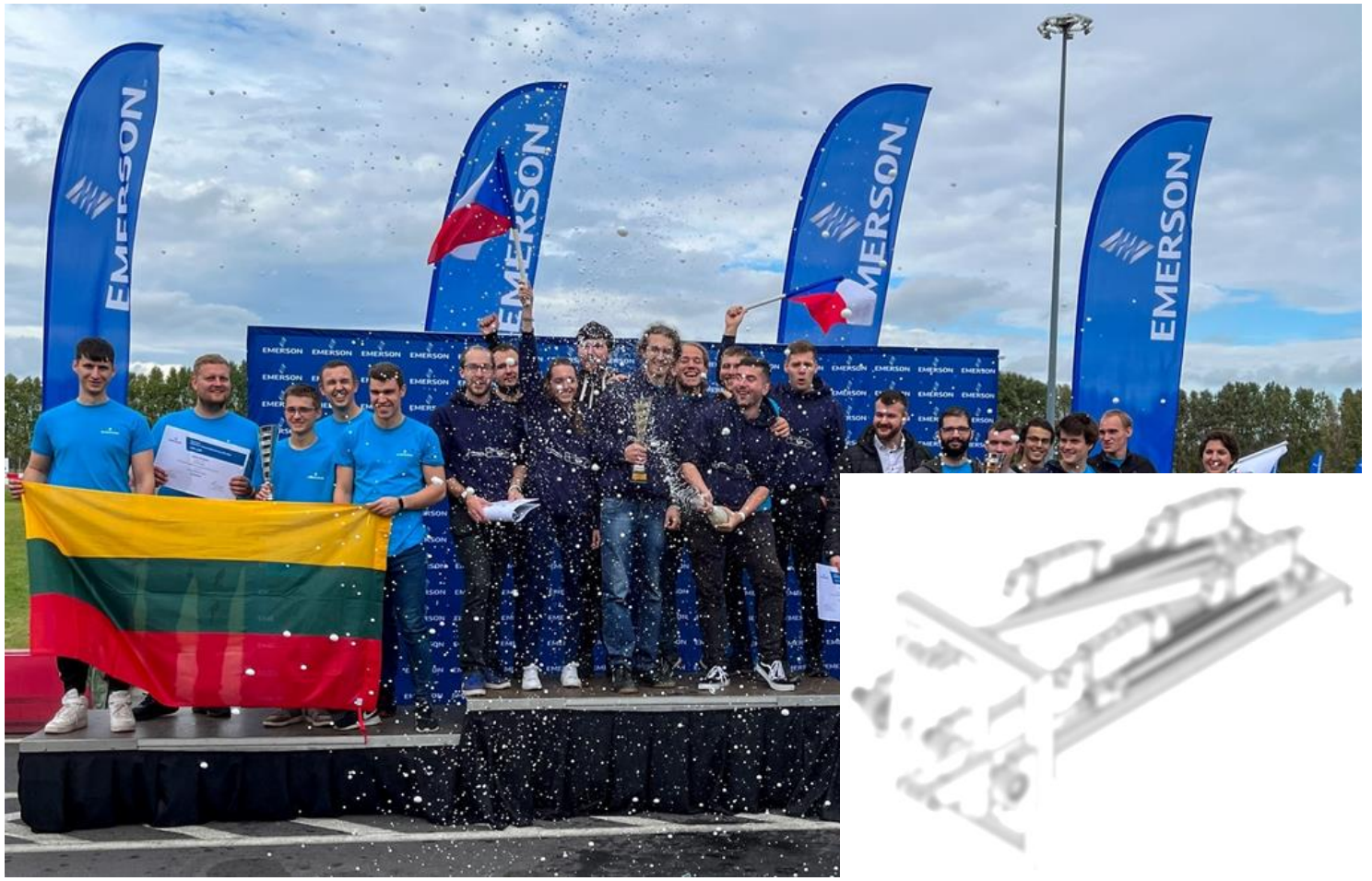
2022

PNEUMOBILE, PNEURACER

- Competition in Kecskemét
  - Pneumobile Team Leader
- Drawings correction before manufacturing – canceled Hurricane vehicle (canceled competitions)



INSTITUTE OF MACHINE AND INDUSTRIAL DESIGN

2024
-2025

PNEUMOBILE, PNEURACER

- Pneuracer Mentor

5. 6. 2025 – HLAVNÍ SOUTĚŽNÍ DEN

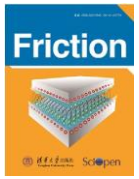
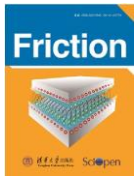
Tomáš Poláček
Teamleader
Pneumobil Racing
Team Brno

Tomáš Poláček
Mentor
Pneuracer VUT Brno

INSTITUTE OF MACHINE AND INDUSTRIAL DESIGN

2021
-2025

RESEARCH

Liquid superlubricity of lubricants containing hydroxyl groups and their aqueous solution under rolling/sliding conditions **Tomáš POLÁČEK, Petr ŠPERKA, Ivan Křupka**		2021-2023 *published*
Superlubricity of polyethylene glycol solutions: Running-in effects, thickness changes, and rheology **Tomáš POLÁČEK, Martin KADLEC, Jiří SMILEK, Martin Hartl, Petr ŠPERKA**		2023-2025 *major revision*
Influence of surface roughness on molecular flow through labyrinth seals for space applications **Josef POUZAR, David KOŠŤÁL, Lars-Göran WESTERBERG, Erik NYBERG, Tomáš POLÁČEK, Karel JUŘÍK, Ivan KŘUPKA**		2025 *before submission*

Effect of molecular weight on film thickness in glycol solutions	*measurements in process*
Thermoresponsive gelation of Pluronic F-68 and its effect on film thickness formation	
Pectin based gel in EHL film	

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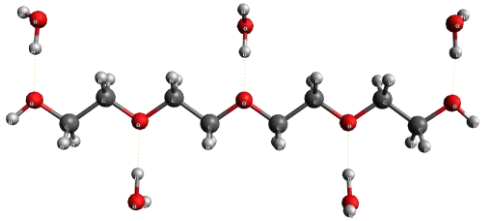
2021
-2025

PHYSICAL CHEMISTRY

SELF-STUDY (2021-2025)

- Molecular modelling and analytical calculation of the polymer size



- Micelization and gelation process (chemistry and rheology)

- Electrical double-layer

COOPERATION (2023-2025)

- FCH Materials Research Centre Dr. Smilek, Ing. Kadlec
  - Collaboration on liquid/gel analysis

BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF CHEMISTRY

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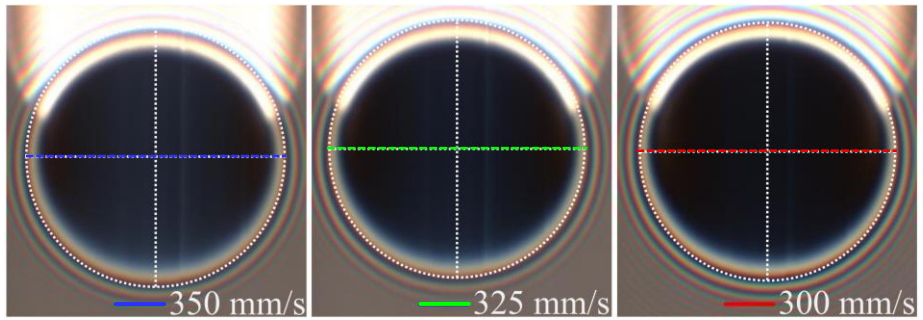
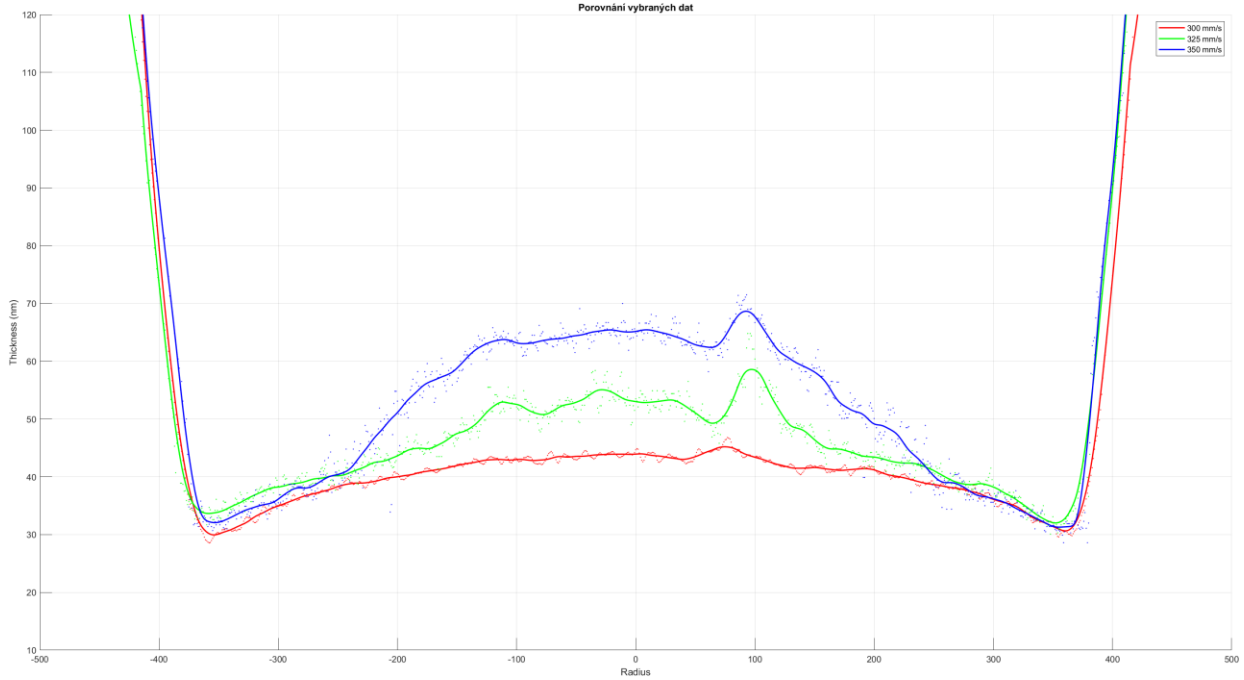
RESEARCH

2D THICKNESS MEASUREMENT

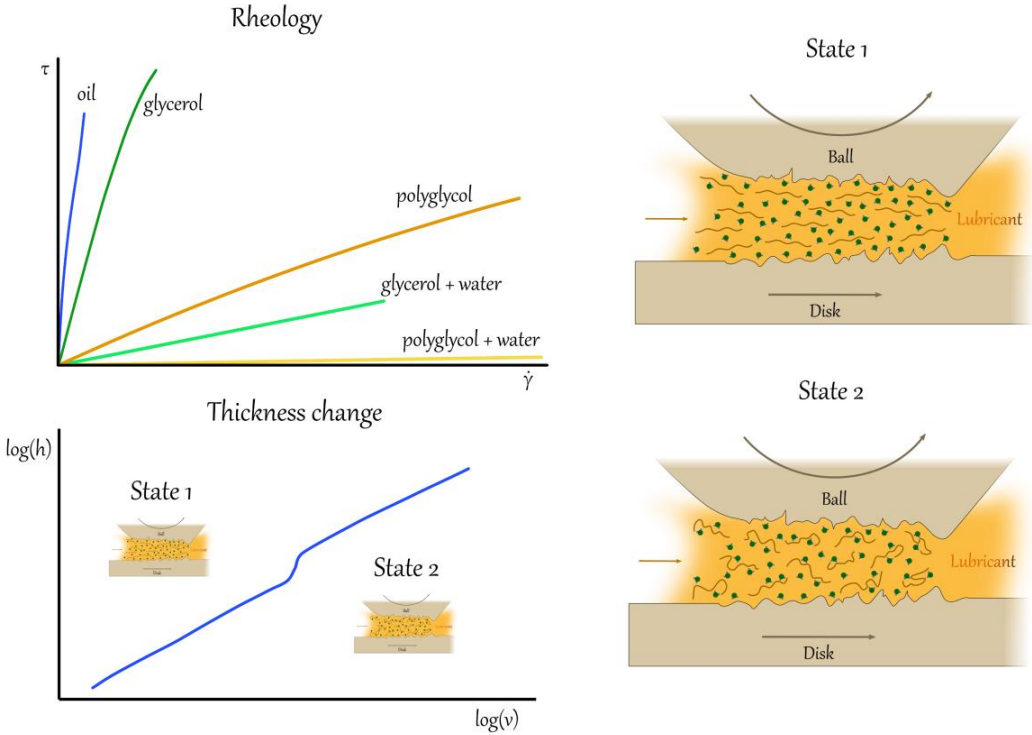
- MATLAB .exe file „*2D Thickness*“



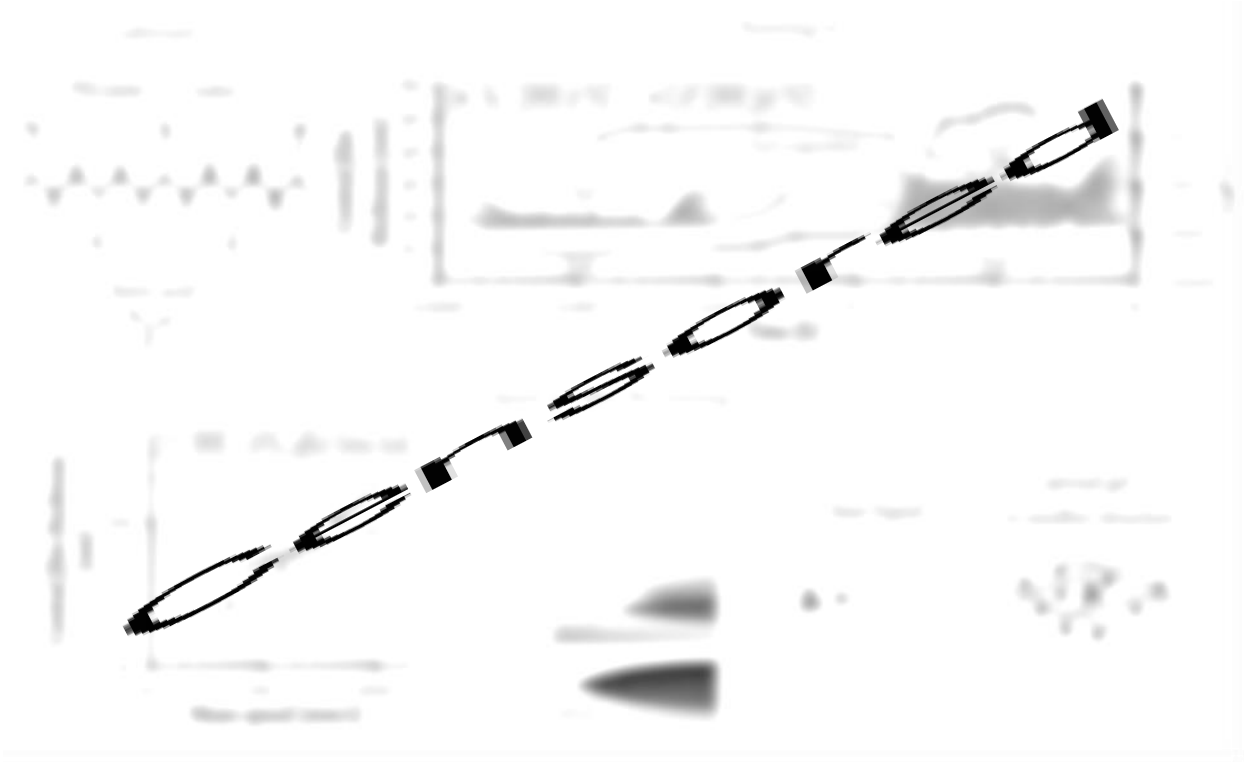


FROM LIQUID SUPERLUBRICITY TO GEL

Liquid superlubricity of lubricants containing hydroxyl groups and their aqueous solution under rolling/sliding conditions

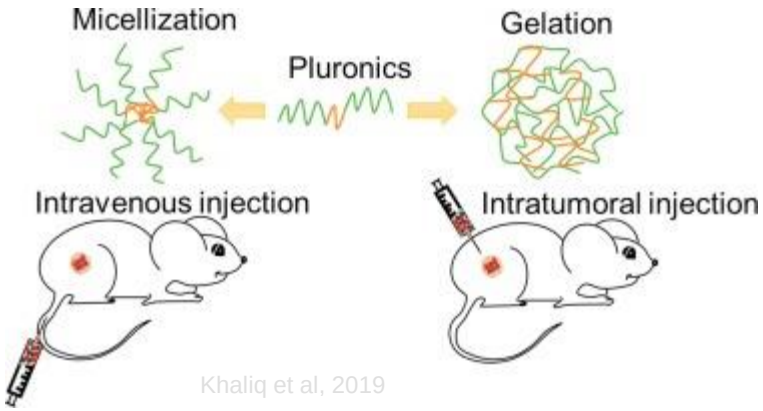


Superlubricity of polyethylene glycol solutions: Running-in effects, thickness changes, and rheology

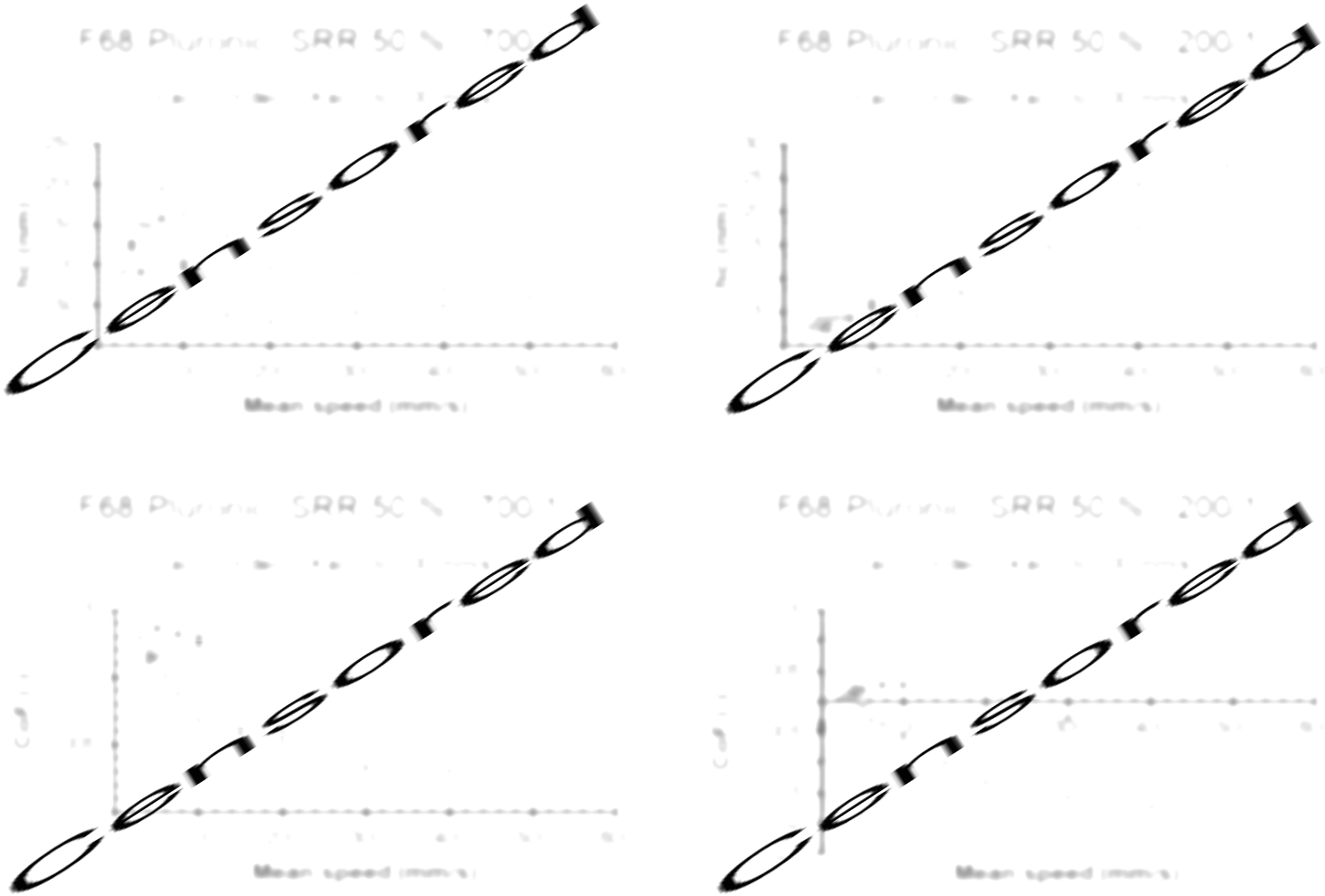


FROM LIQUID SUPERLUBRICITY TO GEL

Thermoresponsive gelation of Pluronic F-68 and its effect on film thickness formation



Khaliq et al, 2019



HIGH PRESSURE DENSITY MODIFICATION

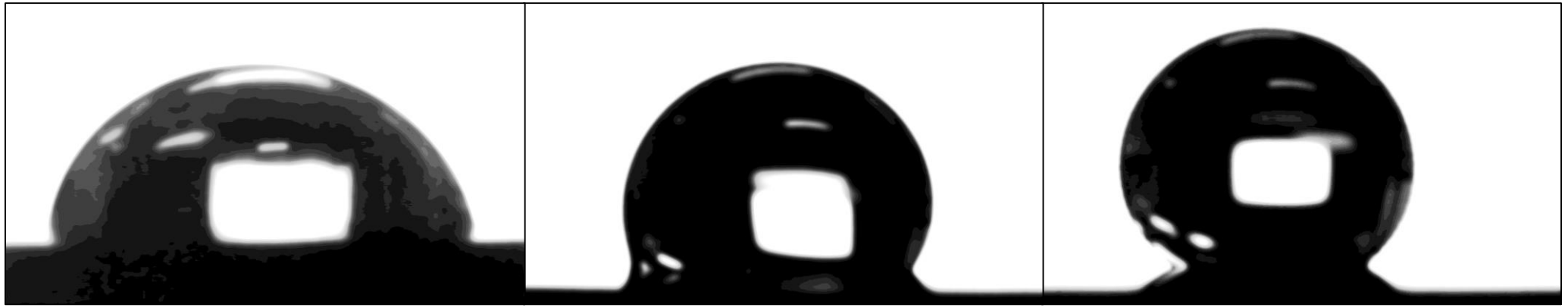
- Still unsuccessful (power lead shot)

LEED-LYON SYMPOSIUM ON TRIBOLOGY 2024

- 1st conference
- 1st flight in an airplane
- 1st food poisoning abroad

CEITEC COOPERATION

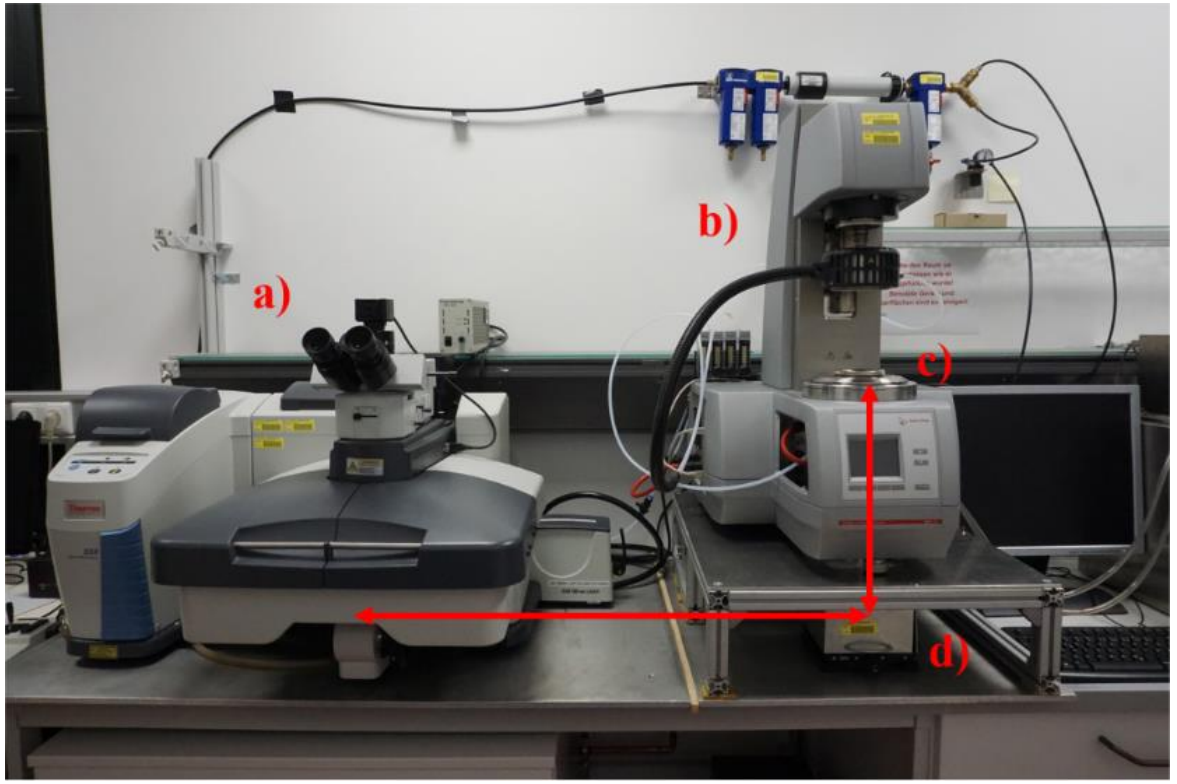
- Dr. Lepcio
  - Gel/micel analysis – DLS (dynamic light scattering): difussion coefficient, hydrodynamic radius, critical micel concentration (CMC);
    – rheometer: gelation point, viscosity at ambient pressure
- Dr. Macák
  - Ti samples with modified surface → different contact angle (with water)



2025

INTERNSHIP

- Johannes Kepler University in Linz
  - Simultaneous measurement
    by rheometer (b)
    and Raman spectrometer (a)
  - Contact via Dr. Smilek from FCH
- Until end of 2025 (in process)



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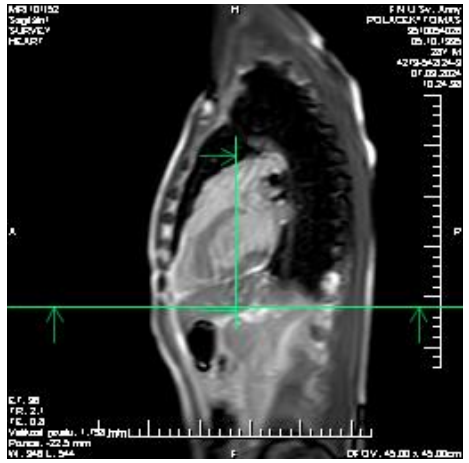
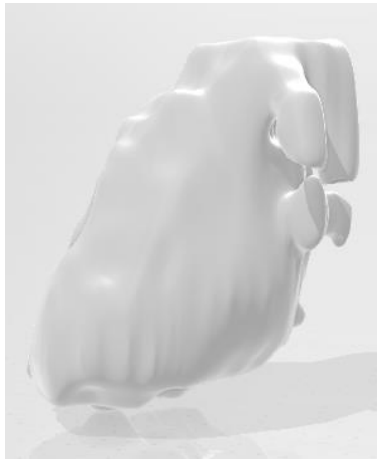
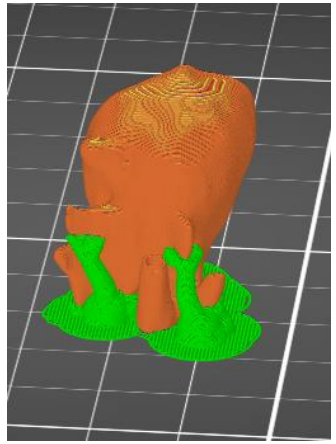
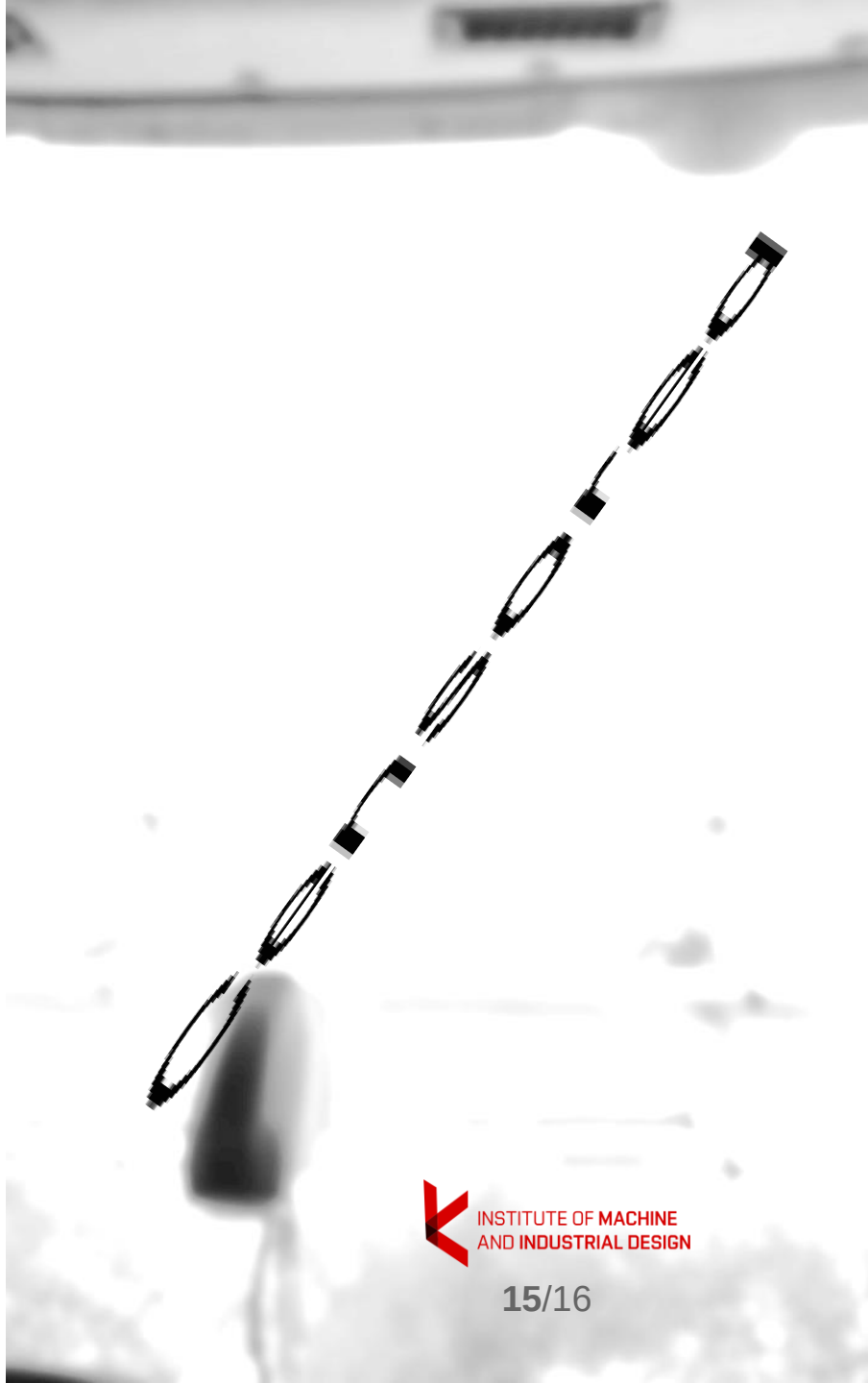
OUTSIDE THE BOX



3D Slicer



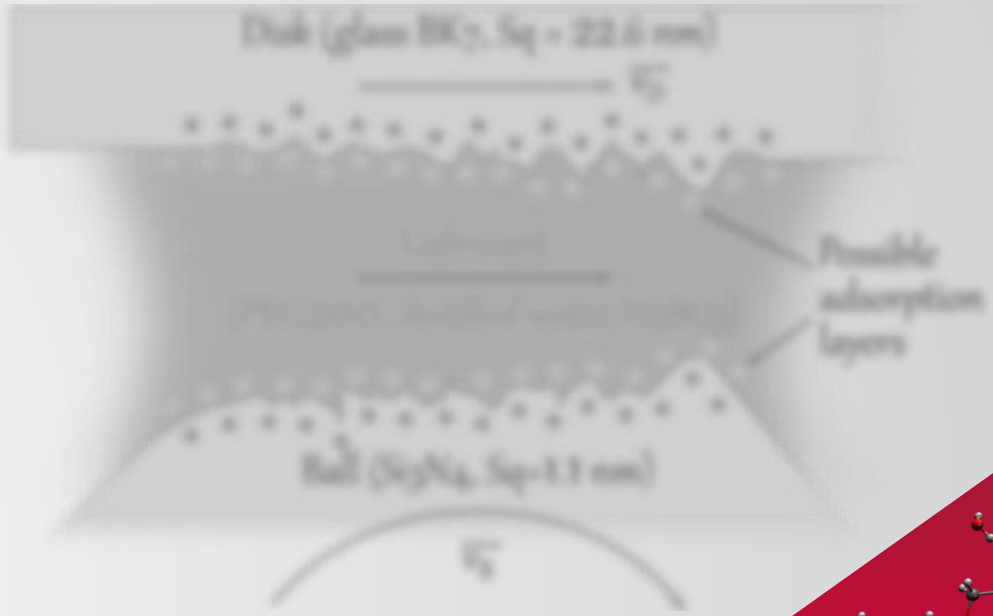


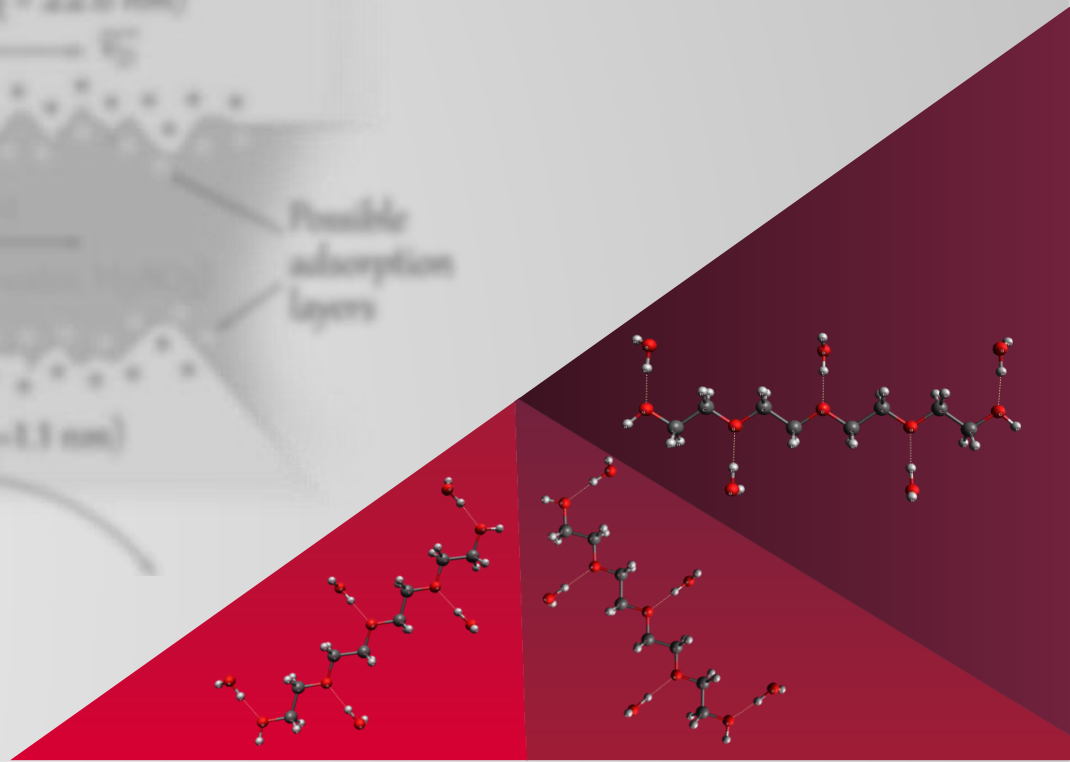


THANK YOU FOR YOUR ATTENTION

Tomáš Poláček, Ing. et Ing.

Tomas.Polacek2@vut.cz





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