MISKOLCI EGYETEM

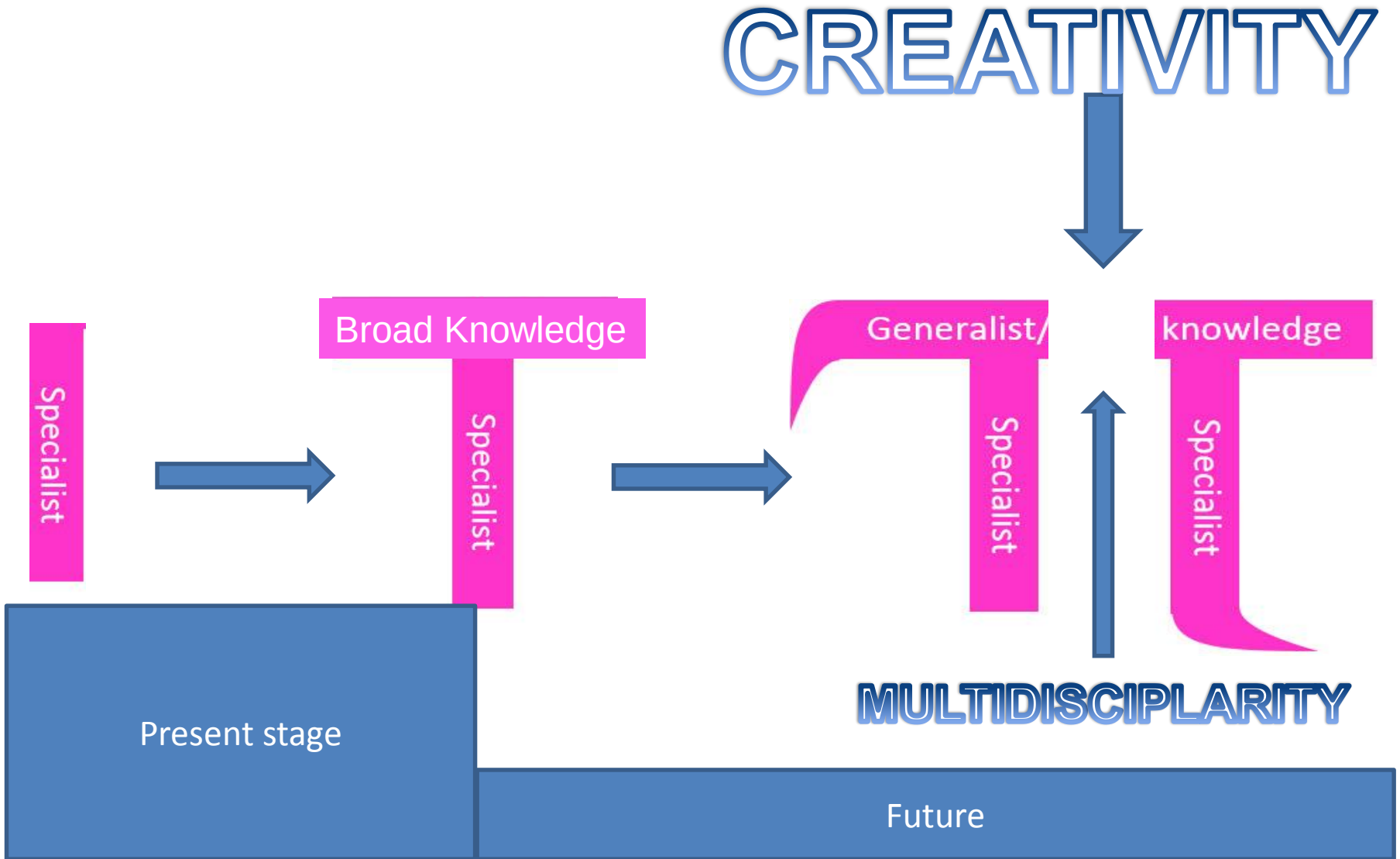
UNIVERSITY OF MISKOLC

Case Study:
Industry University Collaboration

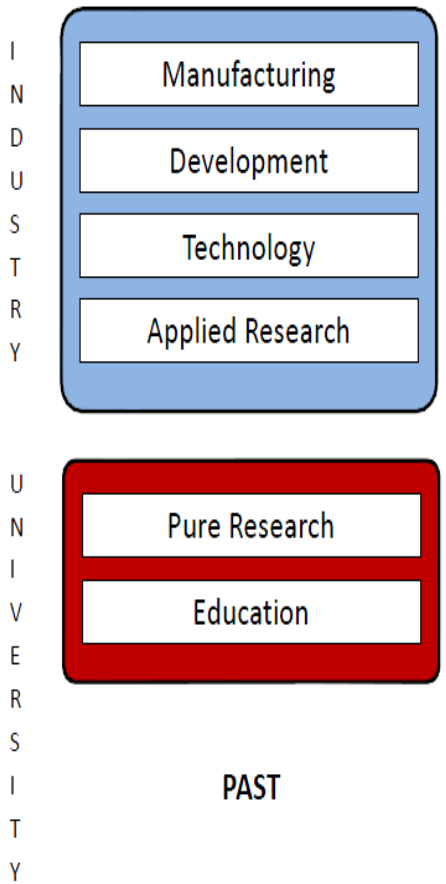
Research 2.0
Education 3.0

Attila Béres – Wanhua BorsodChem
Béla Viskolcz – University of Miskolc

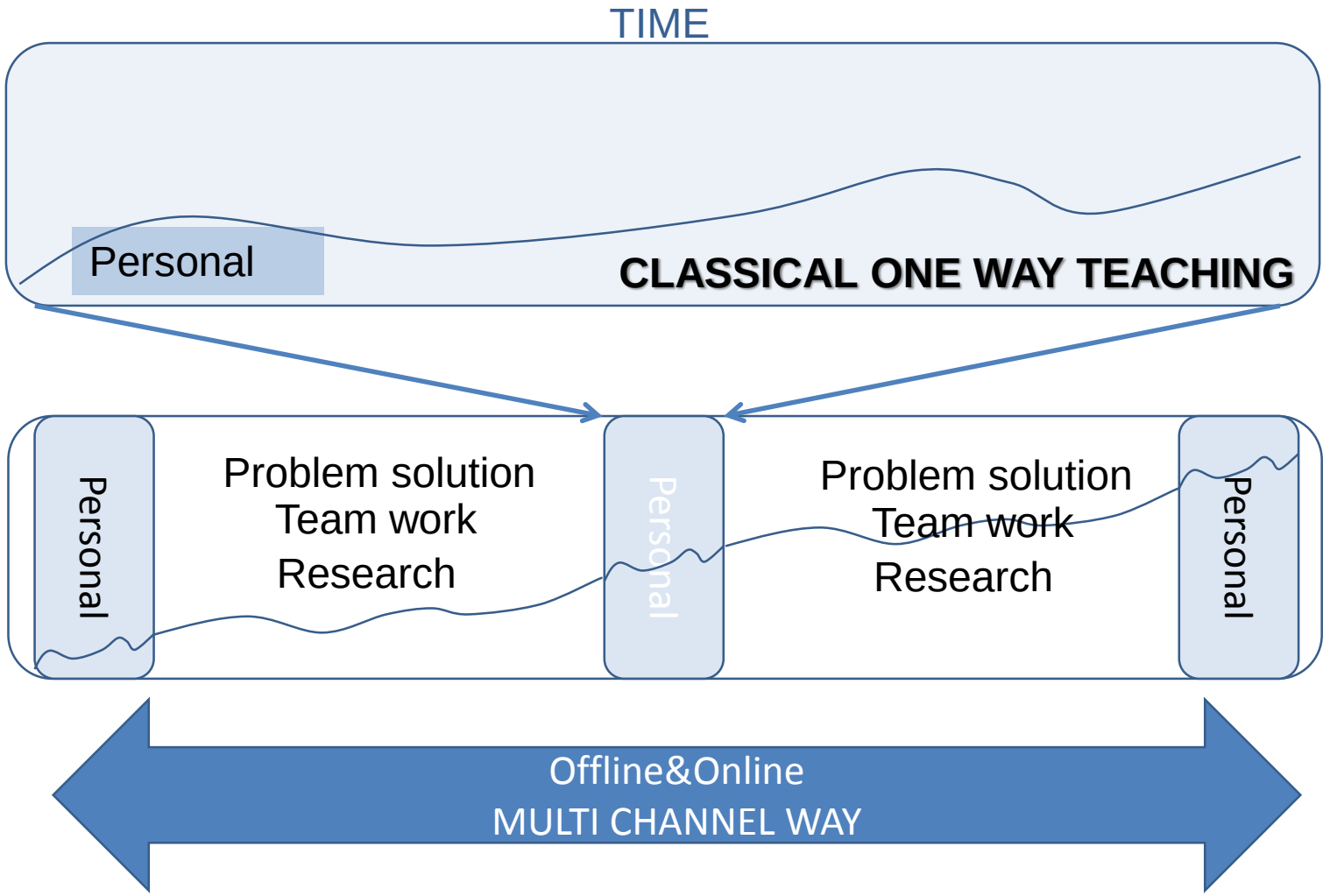
CHALLENGE FOR EDUCATION



Paradigm Shift in the 21st Century



Methods: Teaching with Research



- ✓ Project Oriented Training
- ✓ Dual training
- ✓ Personalized training
- ✓ Doctoral training

Education 3.0

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WANHUA 万华

BorsodChem
Chemistry for generations

History of Wanhua & BorsodChem

1983
Initial MDI Plant Yantai 10 KT

2001
IPO Shanghai

2005
Ningbo I. commissioned 300 KT

Open global offices

2010
MDI 800 KT

2011
Wanhua acquires BorsodChem

2015-2016
New Industrial Park in Yantai Phase I-II

MDI capacity 1800 KT

2017
Zhuhai Industrial Park Phase 1

2012
MDI capacity exceeded 1200 KT

2013
MDI expansion 1400 KT

Wanhua

BorsodChem

Wanhua BorsodChem

1949
Establishment of BVK

1991
Start of MDI-1

1963
Start of PVC-1

1969
Start of PVC-2

1978
Start of PVC-3

2001
Start of TDI-1

2000
Integration of aniline

2005
Integration of BTX

2006
Start of MDI-2

PVC capacity expansion 400 KT

Membrane plant Phase I-II

2009
MDI-2 Debottlenecking 150 KT -> 160 KT

2011
MDI revamp 240 KT

New TDI-2 Plant 250 KT

2013
Membrane plant Phase III

2014
MDI revamp 260 KT

2015
MDI revamp 300 KT

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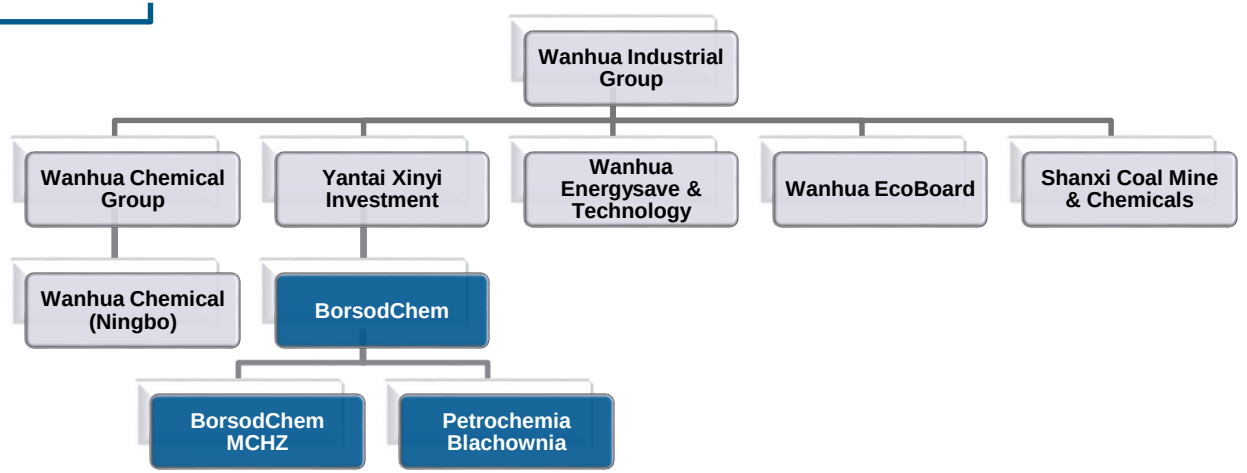
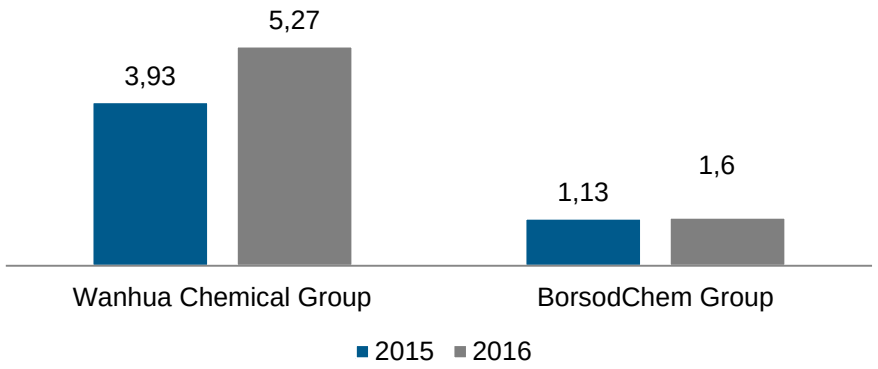
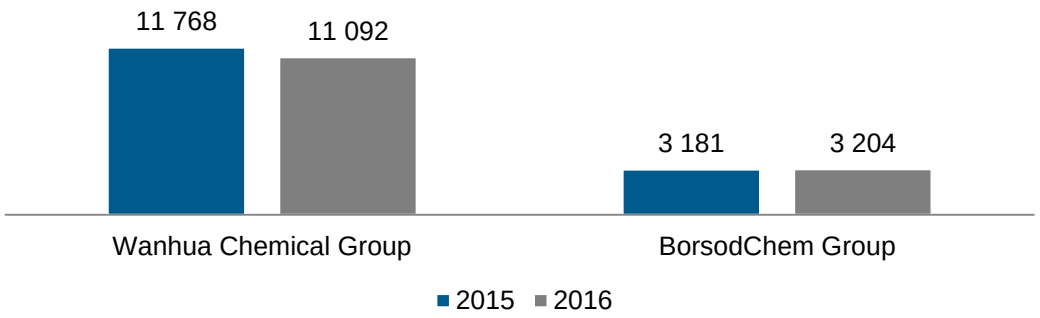
Wanhua BorsodChem
Facts and figures



Revenue (b EUR) *

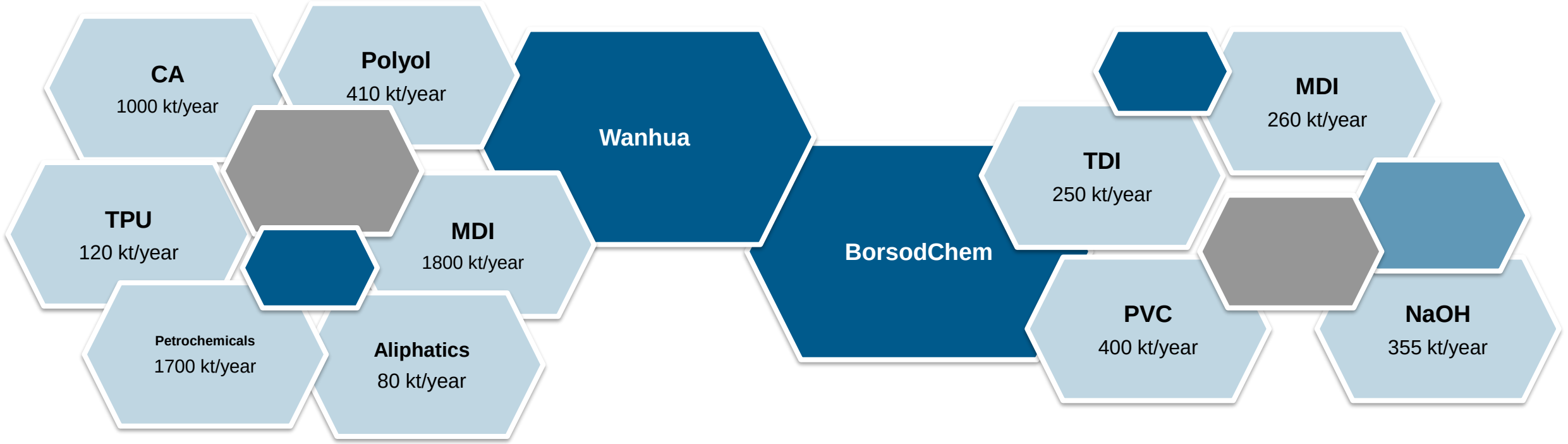


Number of employees *



** Wanhua Chemical Group inlcuding BorsodChem*

Core Product Capacities



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BorsodChem
MDI Plant

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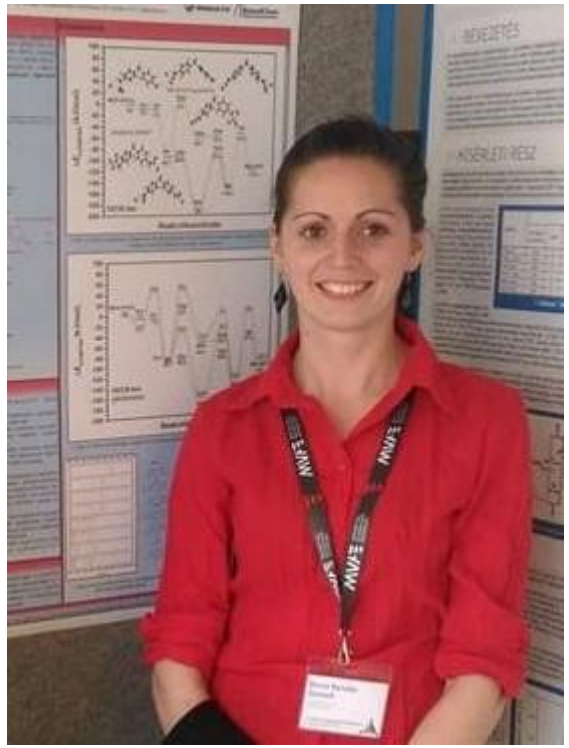
Main projects of Phd dissertation

(Title: Studying the elimentery steps of isocyanate production)

1. MDA synthesis - mechanism of the reaction between aniline and formaldehyde
2. MDI synthesis - phosgenation mechanism
3. MDI dimers
4. Biopolymers - reaction of MDI with different biomolecule motifs



Zsanett Boros

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Procedure of the examination

PHENOMENON

empirical methods

experimental design

experiments in lab

set up of database

theoretical (computational) chemistry

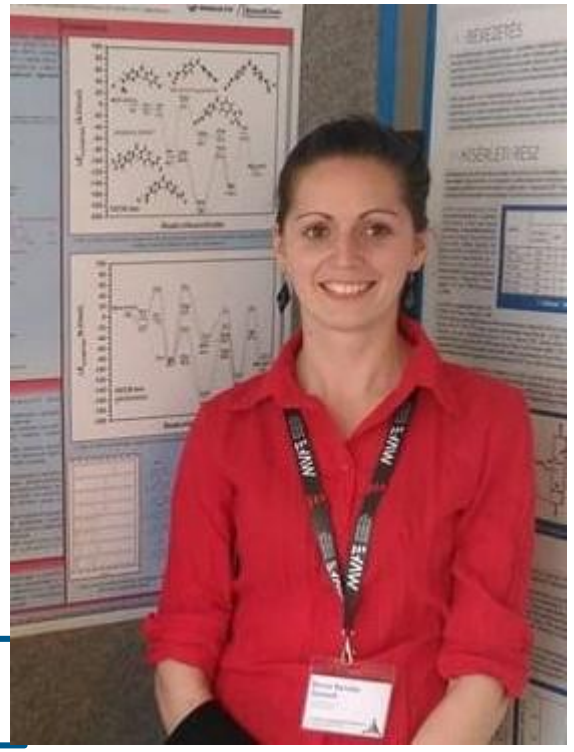
geometry optimization, lower level (HF/3-21(G))

energy and frequency calculations, higher level (B3LYP/6-31G (d)

theoretical energies, relative energies, entropies and enthalpies

evaluating of results, making a conclusion

comparing the empirical and theoretical results



Zsanett Boros

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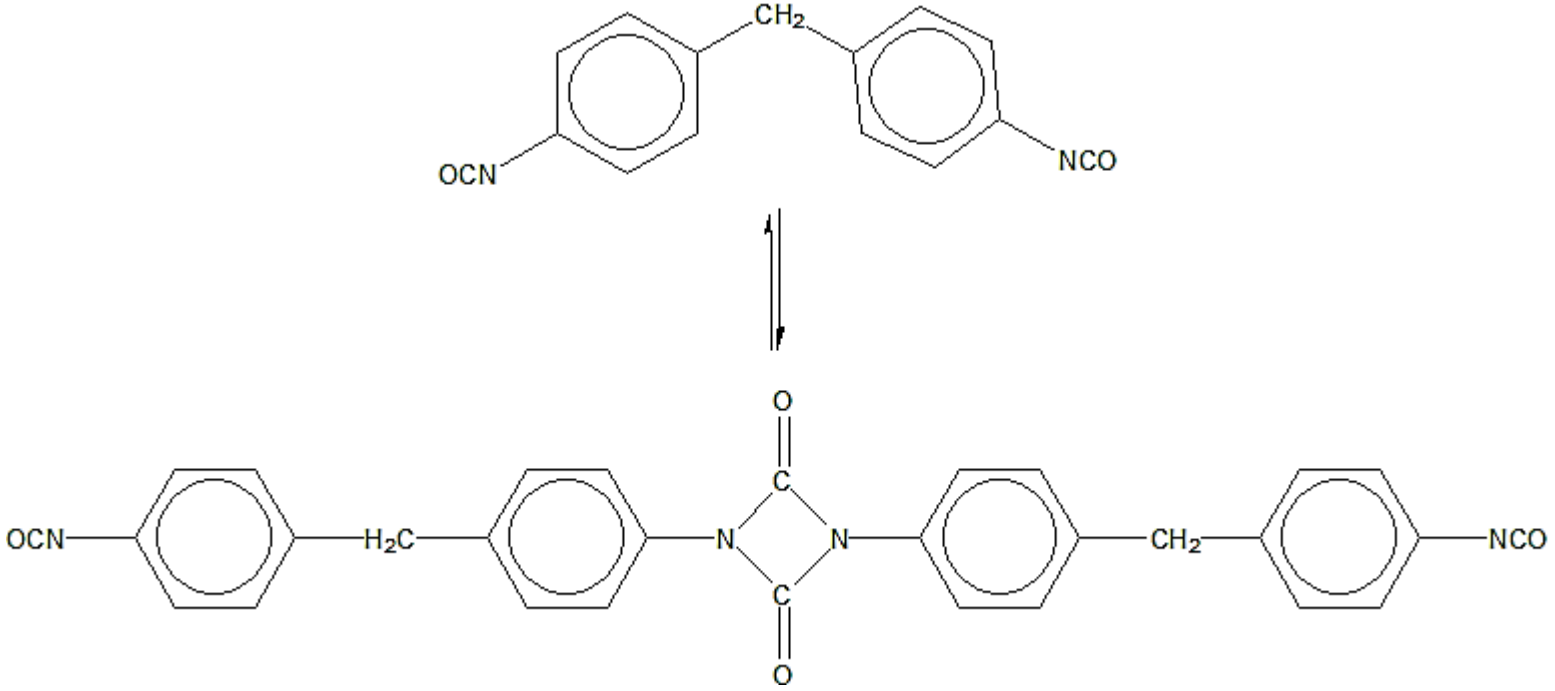
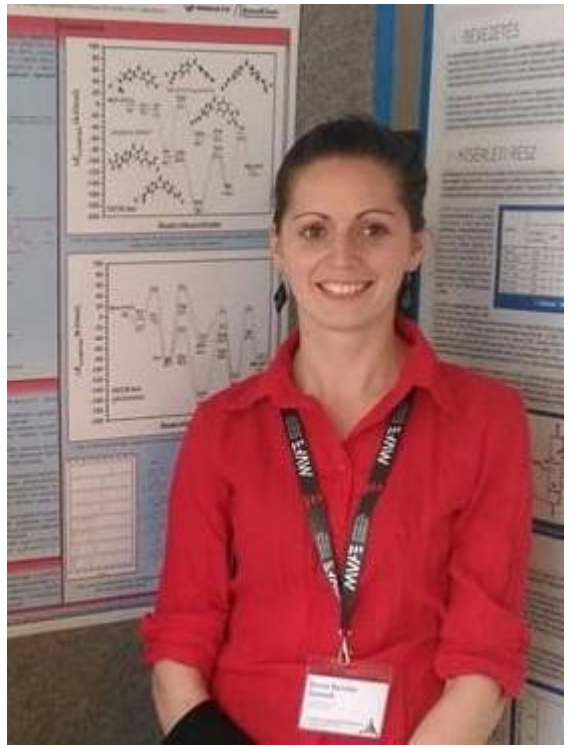
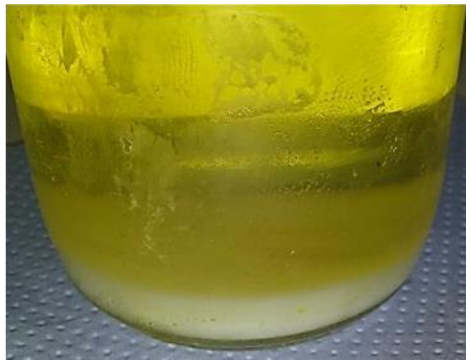
MDI dimer formation by storage





Zsanett Boros



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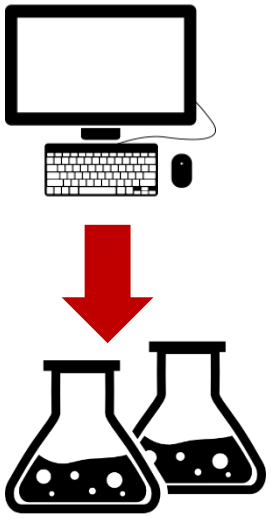
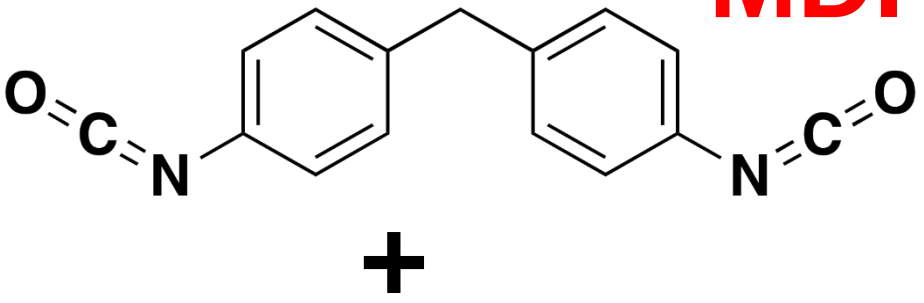
Master thesis

Title:Synthesis of Fructose-Based Polyurethane

100+ Experiments



MDI



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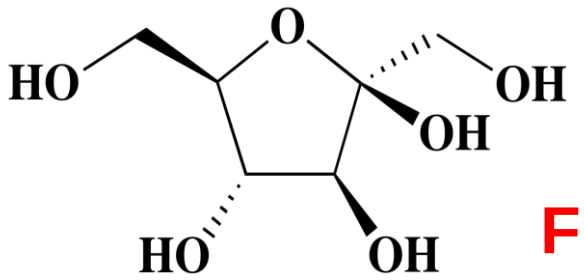
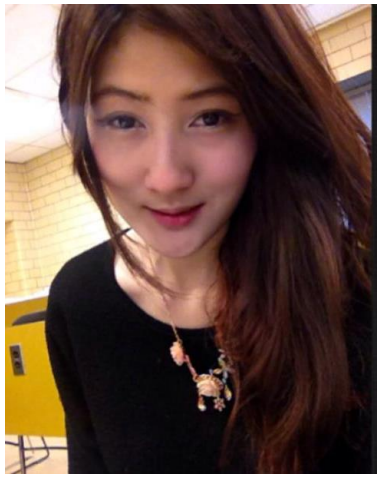


Fructose



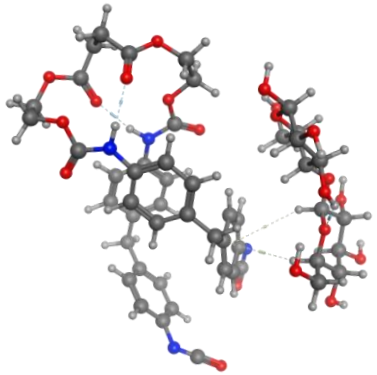
Min-Yen (Emily) Lu

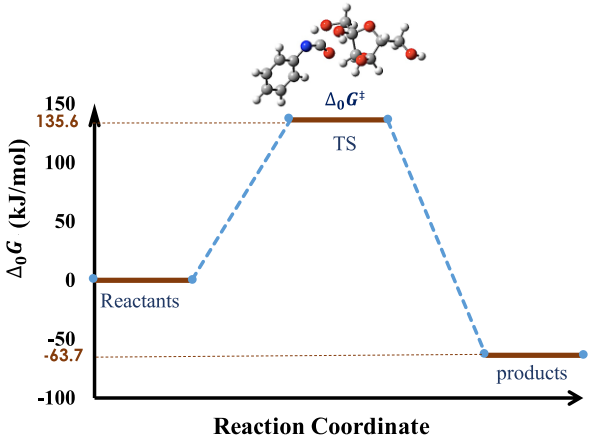
WANHUA 万华

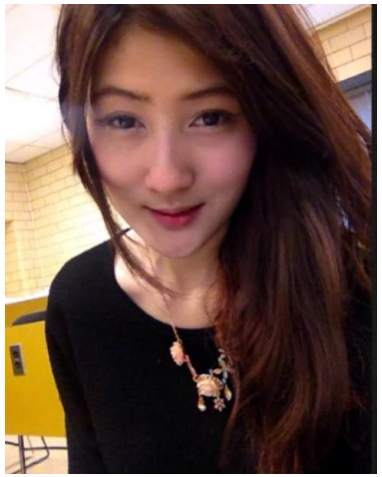
BorsodChem
Chemistry for generations

Master thesis

Title:Synthesis of Fructose-Based Polyurethane







Min-Yen (Emily) Lu

Mechanistic study ✓

Reactivity ✓

Synthesis ✓

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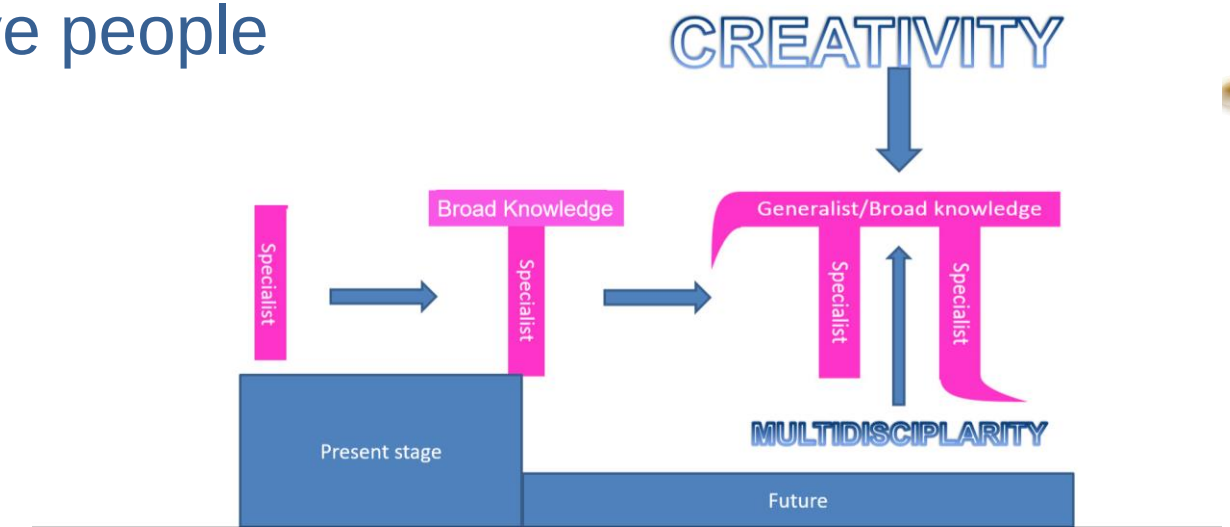
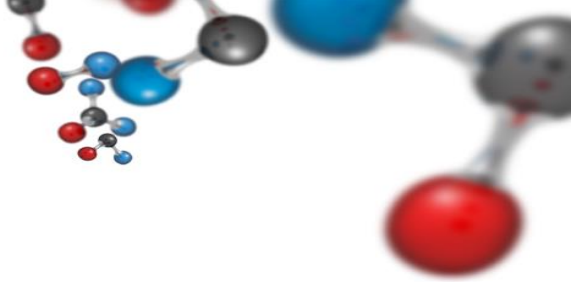
CONCLUSIONS

- Objectives were reached
- Education and research were combined to solve industrial problems
- Joint work
  - complementary interest
  - Complementary infrastructure
- Creative people





THANK YOU FOR YOUR ATTENTION
KÖSZÖNÖM A FIGYELMET
感謝您的關注

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KÖSZÖNÖM
A MEGTISZTELŐ FIGYELMET!

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Miskolci Egyetem

SZÉCHENYI 2020
MAGYARORSZÁG KORMÁNYA
Európai Unió
Európai Regionális Fejlesztési Alap
BEFEKTETÉS A JÖVŐBE

Conferences, papers

2016.03.16-18	Empirical and Theoritical Study on Molecules of Isocyanate Synthetis – **Blankenberge, Belgium ChemCys**
2016.05.12	Empirical and Theoritical Study on Molecules of Isocyanate Synthetis, **Miskolc, KeMoMo – QSAR 2016 symposium**
2016.05.26-27	Computational study on isocyanate-peptide adduct as potential biocompatible polymers. **Warsaw, Poland, 7th Visegrad Symposium on Structural Systems Biology**
2016.06.18-21	Theoritical investigation of Methylenediphenyl Diamine Synthesis, **Szeged KeMoMo – QSAR 2017 symposium**
2017.06.01-02	Study on Rectivity of Methylene Diphenyl Diisocyanate (MDI) with Biomolecule Motifs, **7th Visegrad Symposium on Structural Systems Biology, Nove Hrady, Czech Republic**
2017.06.21-24	Studying one of the main important raw material of polyurethane synthesis via computational chemistry **XI. National Material Science Conference, Balatonvilágos**

In the near future

Conference	Accepted abstract for THE **LEADING** INTERNATIONAL EXHIBITION AND CONFERENCE FOR THE **GLOBAL POLYURETHANES**INDUSTRY, May of 2018, Netherleads
Publications under progress	Industrial Application of Molecular Computation on Dimerization of Methylene Diphenyl Diisocyanate
	A Theoretical Study of the Methylene Diphenyl Diisocyanate (MDI) Synthesis via Phosgenation of Methylene Diphenyl Diamine (MDA)