



ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАИ

1000 София
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Basic Information:

Course Title: MECHANOCHEMISTRY FOR GREEN PREPARATION AND RECYCLING OF CATALYSTS AND ADVANCED NANOMATERIALS

Lecturer: Prof. Z. Cherkezova- Zheleva, PhD

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Total Teaching Hours: 30 hours + 15 hours practicum

Annotation (up to 150 words)

The lecture course is addressed to PhD students with interests in the field of material research and catalysis. Basic knowledge of structure in the material's structure and characterization methods will be appreciated.

The lecture focus is on the use of mechanochemistry as a green and sustainable method for synthesis, activation and recycling of advanced nanomaterials and catalysts. Different mechanochemical protocols that can offer advantages over existing solution-based methods will be discussed. Number of ex situ and in situ emergency characterization methods will be covered in order to follow and understand mechanochemical transformations in materials and to find out new synthetic or recycling procedures.

A practical course will also be held to build skills related to preparation and recycling of multifunctional composite materials and catalysts by mechanochemical method. It aims to familiarize the participants with the specific scientific and technical challenges in the field of laboratory and industrial application of mechanochemistry.

Course content (brief description by topics or modules)

Topic / Module 1: Fundamentals of Mechanochemistry, Mechanochemical Synthesis and Activation Methods

Topic / Module 2: Mechanochemical Approaches for Recycling Spent Automotive Catalysts

Topic / Module 3: Mechanochemical Synthesis and Recycling of Magnetic Materials

Teaching and assessment methods

Group or individual teaching

Examination – theoretical and practical

Competencies acquired as a result of training (3–5 points)

- In-depth knowledge in the field of mechanochemistry and its application in the synthesis and recycling of functional materials and catalysts.
- Acquisition of practical skills for working with mechanochemical methods for material synthesis and processing.
- Acquisition of knowledge about sustainable and green approaches for the synthesis, modification, and recycling of materials.
- Development of skills for applying mechanochemical approaches in the recycling of automotive catalysts and magnetic materials.
- Understanding of the possibilities for laboratory and industrial applications of mechanochemistry in modern material's science and catalysis.

Literature:



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1. Baláž P., Achimovicová M., Baláž M., Billik P., Cherkezova-Zheleva Z., Criado J.M., Delogu F., Dutková E., Gaffet E., Gotor F.J., et al. Hallmarks of Mechanochemistry: From Nanoparticles to Technology. *Chem. Soc. Rev.* 2013;42:7571–7637. doi: 10.1039/c3cs35468g.
2. Baláž P. *Mechanochemistry in Nanoscience and Minerals Engineering*. Springer; Berlin/Heidelberg, Germany: 2008. pp. 1–413.
3. Guo X., Xiang D., Duan G., Mou P. A Review of Mechanochemistry Applications in Waste Management. *Waste Manag.* 2010;30:4–10. doi: 10.1016/j.wasman.2009.08.017.
4. Šepelák V., Becker K.D. Mechanochemistry: From Mechanical Degradation to Novel Materials Properties. *J. Korean Ceram. Soc.* 2012;49:19–28. doi: 10.4191/kcers.2012.49.1.019.

Additional information (optional) (e.g., special requirements, laboratory equipment, prior knowledge)

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