

National Technical University of Ukraine

“Kiev Polytechnical Institute”

Chemical Technology Department

Laboratory of Ion Exchange and Adsorption

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- Recent projects •

About National Technical University of Ukraine



NTUU “KPI” is one of the oldest and largest technical universities in Europe. It was **founded in 1898**.

40 500 students study at **29 University Colleges**. NTUU “KPI” has drawn 1 500 students from all over the world.

58 Academicians and **10 000 Professors and Researchers** provide their activity in NTUU “KPI”.

Every sixth student in Kyiv is a KPI student and every third student in Ukraine in Engineering is a KPI student...

About National Technical University of Ukraine *Chemical Technology Department*



The faculty of Chemical Technology was one of the four faculties of Kiev Polytechnic Institute founded in 1898. Currently the Faculty consists of **8 departments** and **8 research laboratories**.

Prof. DSc Igor Astrelin
Head chair of Department (s. 1983),
Dean Faculty of Chemical Technology (s. 2000)



About NTUU “KPI”, Chemical Technology Department

International cooperation

Several International projects are established between The Faculty and foreign research and education institutions



Double Diploma Program with
Université du Maine (France)



Research cooperation with
University of Giessen (Germany)



Research cooperation with
University of Dresden (Germany)

Partnership



University of
Georgia
(USA)



Rzeszów
University
(Poland)



Universidad
de Oviedo
(Spain)

Laboratory of Ion Exchange and Adsorption



In 1996 Laboratory of Ion Exchange and Adsorption was founded at Chemical Technology Department of NTUU “KPI”

In 1997 – Laboratory was first time certified by The Ukrainian Quality and Certification Organization. Area of certification: water analysis and investigation of materials for water treatment

2007 – Certification in Ukrainian National Certification System

Our Team



DSc Tetiana Mitchenko

Head of The Laboratory

Personal page:

www.tmitchenko.name

Research experience
since 1974

PhD since 1981

Doctor since 1996

Contributed to more than 200
works, author of 20 patents



PhD Nataliia Makarova, Deputy

Fellows (2011):

Scientific Associates – 2
Engineers – 2

PhD students – 4

Master students - 3

Activities

- **Scientific activities, International research projects**
- **Water analysis and water quality monitoring**
- **Test and investigation of sorption materials: Quality monitoring and approval**
- **Certification of products**
- **Education and training courses for specialists**
- **Publishing: Scientific Journal “Water & Purification Technologies”**

Water analysis and Water Quality Monitoring

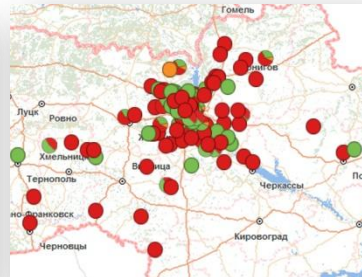
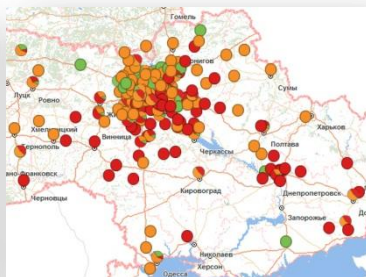
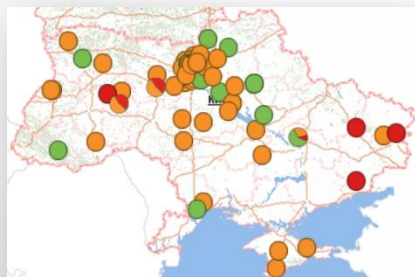


Eng. Helen Shenkaruk

Laboratory is certified in Ukrainian National Certification System for water quality analysis by **34 water quality indicators** according to National Standards of Water Quality

Laboratory provides detection of **specific toxic impurities** in natural waters applying Atomic Absorption Spectroscopy and other progressive techniques

Laboratory is a partner of the water monitoring project provided by National Public Organization “WaterNet” www.waternet.com.ua



More about
The Water Monitoring
Project:
www.voda.org.ua

Test and investigation of materials for water treatment



Sci. Ass. **Helen Shevchuk**

Laboratory is certified in Ukrainian National Certification System for analysis and efficiency estimation of **Activated Carbons** and **Ion Exchange Resins**

Laboratory also provides tests of different **materials for water treatment** and pilot investigations of **water treatment equipment**



Eng. **Tetiana Boiko**

Pilot tests with membranes

- Screening tests
- Application tests
- Performance tests of membrane elements
- Autopsy of elements and membrane microscopy
- Pilot tests
- Investigation of cleaning agents and biocides: determination of the foulant type and effective cleaning. Cleaning evaluation



Certification of products



Laboratory provides assistance for producers and companies which intend to obtain quality certificates for their products:

- Approved technical specifications
- Sanitary-Epidemiological Conclusions
- Certification in Ukrainian quality control system

Scientific activities – Recent Topics

- Removal of transition metals from water with exhausted anion exchange resins
- Intensification of sodium-cycle for industrial and domestic water treatment
- Intensification of membrane desalination applying membranes of different density
- Hybrid sorbents based on anion exchange resins and NOM
- Biocide sorbents based on ion exchange resins and polyelectrolytes
- Utilizing municipal waste water for seawater desalination

Scientific activities – PhD works



Paul Kozlov

Development of low-waste and energy-saving technology for water softening



Elena Svetleishaya

Optimization of the process of river water conditioning by ultrafiltration



Zakhar Maletskyi

Hybrid sorbents based on ion exchangers for removal of transition metals from water



Maria Sus

Biocide sorbents and disinfection technologies based on guanidine polyelectrolytes and ion exchangers

Scientific activities – Recent Projects

Joint Research project with [Karlsruhe Institute of Technology](#) (Germany)

Development of new polyfunctional sorption materials based on ion exchange resins exhausted during their application in demineralization processes



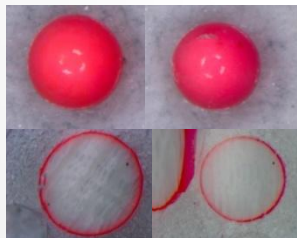
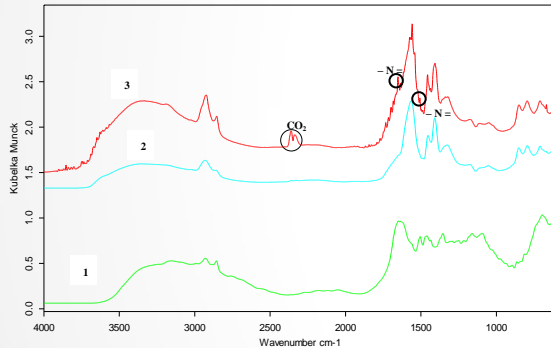
Performed works:

- Problem assessment in Germany and Ukraine
- Collection of samples
- Assessment of chemical and physical properties
- Investigation of the exhaustion mechanism applying FTIR, SEC, Stereomicroscopy, ESEM
- Sorption experiments with Fe, Cu, Ni
- Investigation of sorption mechanism applying Stereomicroscopy, ESEM, EDX
- Measurements of bead surface hydrophylicity and investigation of NOM role

Scientific activities – Recent Projects

Uptake of the polyhexamethyleneguanidine (PGMG) biocide from the water by ion-exchange resins

Idea: PHMG can be a very effective polymeric biocide for water disinfection, but potable and some kinds of process water should not contain PHMG excess. Thereby special type of ion exchange resin can be used for PHMG retention.



Performed works:

- Comparative investigations of the sorption ability aimed to PHMG for a wide range of ion exchange resins.
- Investigation of the polymer – resin interaction mechanism by means of FTIR & Stereomicroscopy.
- Equilibrium and kinetic experiments.
- Ascertainment of the influence of major process factors on PHMG retention.

Scientific activities – Recent Projects

Optimization of the UF technology for surface water treatment



Pilot installation

Performed works:

- Laboratory tests with different types of coagulants which can be used for on-line injection before UF stage
- Optimization of the coagulate dosing
- Investigation of the temperature influence on COD_{Mn} and Color removal
- Pilot plant investigation of combined coagulation-ultrafiltration technology

Scientific activities – Recent Projects

INTAS Project “Water purification for food production”

Joint research with [Engler-Bunte-Institute](#) (Germany)



Multi-component filtering media for **tap water treatment** and **industrial application**

Performed works:

- Determination of **typical forms and compositions of impurities in water**
- Investigation of the **adsorption-desorption of humic substances (HS) by polymeric adsorbents**
- Investigation of the **adsorption of HS, THM** and heavy metals from tap water by carbonaceous adsorbents with programmed porous structure
- Investigation of the processes of mineral composition correction and undesirable impurities removal from water by ion-exchange adsorbents
- **Pilot tests**
- **Development of multi-module layouts for high-effective feed water treatment plants** for the Ukrainian and Moldavian food and beverage industries

Scientific activities

Publications and conferences in 2010:

- Articles in press – 6
- Presentations at international conferences – 21
- Presentations at young specialists conferences -8

Foreign Conferences attended in 2010:

- Membranes in the production of drinking and industrial water, Norway
- 19 International Congress of Chemical and Process Engineering CHISA, Czech
- IWA Regional Conference and Exhibition on Membrane Technology and Water Reuse, Turkey
- EuroMed 2010, Israel

Publications and conferences in 2009:

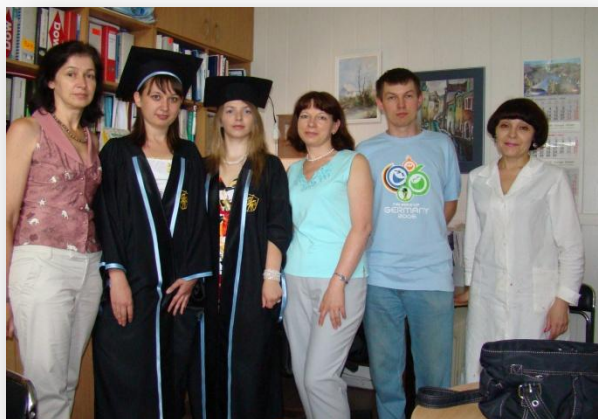
- Articles in press – 5
- Patents – 1
- Presentations at international conferences – 7
- Presentations at young specialists conferences – 3

Foreign Conferences attended in 2009:

- Congress on production safe water, Izmir, Turkey
- World Water Week, Stockholm
- Desalination for the Environment Clean Water and Energy”, Baden-Baden, Germany
- International Conference “Membrane and Sorption processes”, Kiev

Education

Every year students from Chemical Technology Department perform their Diploma works at The Laboratory



Education

Laboratory provides its educational activity by **Technical and Educational Center “Modern Materials and Technologies for Water Treatment”**, founded in cooperation with [Dow Chemical Company](#)



opened in 2008

Education



Center is equipped with a **sorption pilot installation**, which consists of **6 sorption columns**, 2 pressure pumps, 2 feed water and 1 waste water tanks. Each column is equipped with dosing pump, inline injection module, measure and control equipment.



Center also has **3 membrane units**: one unit for 2540-membranes and two units for 4040-membranes



Education – Juniors

Laboratory patronize The International Stockholm Junior Water Prize (National stage)

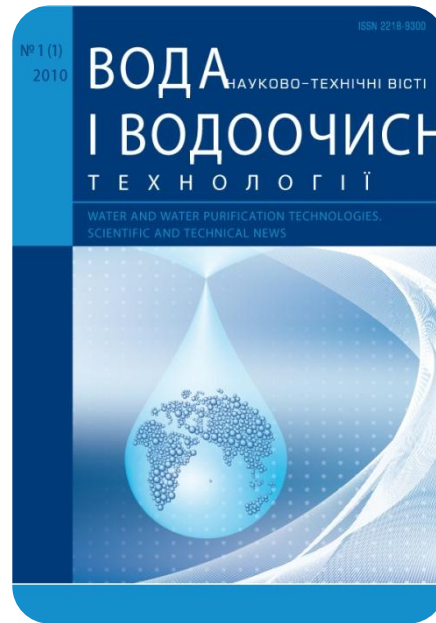


Water & Youth – Together to the future!

Publishing

Laboratory coordinates publishing of Ukrainian scientific journal
“Water and Purification Technologies”

<http://wpt.kpi.ua/en/>



Journal invites authors to submit manuscripts for publication in **English, Ukrainian or Russian** languages

Laboratory of Ion Exchange and Adsorption

National Technical University of Ukraine
37 Pobedi Av., Building 4, Room 117

Contact: mail@zahar.info