Research Center - Faculty/University level

CERNESIM – Research center in environmental sciences for the north-eastern Romanian region

http://cernesim.uaic.ro/index.php/ro/

Laboratory of physico-chemical analyses and Laboratory for the investigation of physico-chemical processes from the atmosphere and for testing new ecological technologies for gaseous pollutants sinks

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Research interest

- identifying and quantifying as instruments of qualitative and quantitative evaluation of pollutant organic volatile compounds;
- identifying and quantifying as instruments of connecting the environmental policies and legislation of North East Romania to the European and international environment politics;

- identifying and quantifying as promises for the future, for the abiding of the laws, the enhancement in the quality of life, the conservation of the biodiversity of the ecosystems;
- elaboration of a high performance methodology for the identification of some isotopes in the environment;
- establishing the impact of volatile organic compounds (VOCs) on the chemistry of the troposphere;
- air pollution and estimating the impact determined by VOCs on the oxidizing species of the troposphere, the nitrogen cycle and eventually on the climate;
- kinetic studies in the gas-state;
- studies on the modifications brought by the anthropogenic factor on the oxidation capacity of the atmosphere, the chemical composition of aerosols and their influence on the climate;
- physico-chemical characterisation of single crystals;
- experimental and theoretical studies of phase transitions;
- thermal analysis and nonisothermal kinetics.

Infrastructure

To gain more detailed insights into the chemical characteristics of the environment, a number of state-of-the-art analytical-chemical techniques, including spectro-photometric, ultra-high resolution mass spectrometric and chromatographic methods are used in our laboratory. Changes in the chemical composition of various matrices due to oxidation and photo-oxidative reactions are investigated, and the corresponding changes in the environment and toxicity of some chemical compounds are explored. The laboratory is well-equipped for the study of various systems with applications to pollution control. Instrumentation for chemical analyses includes ion-chromatographs, organic carbon analyzer, high-pressure liquid chromatographs, and gas chromatographs with MS or FID detectors. These facilities permit studies of the dynamics of various chemicals in a quartz tube reactor with long path length. Instrumentation available for field investigations includes optical particle counters, electrical aerosol analyzers, condensation nuclei counter, low-pressure impactor which can fractionate particles for chemical analysis in size ranges down to 0.02 micron, aerosol generator, and a size classifier for the submicron range. The final goal of our research interest is the development of useful design relationships for the investigated systems based on theory and experiment. Computation facilities and data acquisition systems are also available.

Equipments list (selective)

- Flame Atomic Absorption Spectrometer, Nova AA350-Analytik Jena
- Polarographic stand – TraceLab, Radiometer MDE-150 Radelkis Copenhagen
- Tubidimeter, WTW-TURB-555-IR
- High Resolution Atomic Absorption Spectrometer, ContrAA 700 Analytik Jena
- Total organic/nitrogen content analyzer, Multi N/C 3100 Analytik Jena
- Furnace, Nabertherm, More than 30 - 3000C heat
- Centrifuge, Hettich Universal 320R Zentrifugen
- HPLC, Agilent 1100 Series
- Ion Chromatograph, Dionex 3000
- UV -vis spectrophotometer, Analytik Jena Specord 210 Plus
- Spectrofluorimeter, Edinburgh Instruments Xe 900
- IR- VCD spectrometer, Chiral IR- 2X BioTools
- Organic carbon and elemental carbon analyzer, SUNSET Laboratory
- FT-IR spectrophotometer with RAMAN unit FT-IR Vertex 70 coupled RAMAN II mode Bruker
- SEM - Scanning electronic microscope with X -ray detection, Quanta 250, FEI
- Analytical balance (with 4 digits)
- Analytical Balance Sartorius CPA 26P - OCE (with 6 digits)

- Microanalytical Balance Sartorius MSU 2 7S (with 7 digits)
- Reaction chamber - capacity of 780 L equipped with a White cell with an optical IR path length of 492 m coupled to a FT –IR spectrometer, Vertex 80, Bruker
- NO/NO2 Analyzer, NOx Ecotech EC 9841 series
- O3 Analyzer, O3 Ecotech EC 9810 series
- SO2 Analyzer, SO2 Ecotech EC 9850 series
- CO Analyzer, CO Ecotech EC 9830 series
- CO2 Analyzer, Ecotech EC 9820 series CO2
- Ozone Generator, Ecotech gang 1100TS
- SMPS Particle Analyzer, TSI Electrostatic Classifier (3080) Condensation Particle Counter + (M3787)
- Mass Spectrometer with proton transfer, PTR IC-TOF -MS, Kore Technologies Limited, TOF - ionization mass spectrometer proton
- Chemical analysis of aerosol spectrometer HR-ToF-AMS, Aerodyne Research Inc. AMS. Aerodyne Aerosol Mass Spectrometer HR- ToF
- Chromatograph with flame ionization detector and thermal desorption GC-FID-MS (Turbo) TDSG-TDSA, 7890 GC System coupled with 240 Ion Trap Mass Spectrometer GC/MS system from Agilent Technologies and TDSG Gerstel thermal desorption unit
- GCxGC chromatograph with MS and FID detectors, GC System 7890 two-dimensional chromatography coupled with mass spectrometer 5975C inert XL EI/CI MSD with Triple Axis Detector
- Thermal system coupled with FTIR spectrometer, STA 449 F3 Jupiter thermal system (Netzsch) coupled to a Tensor 27 FT-IR spectrometer (Bruker) via a type TGA -IR (Bruker)
- Liquid chromatograph with mass detector, LC 1260 Infinity 6224 mass spectrometer coupled with TOF/LC/MS, Agilent Technologies
- Liquid chromatograph with both diode array and fluorescent detectors, 1290 Infinity LC, Agilent Technologies
- Liquid chromatography coupled with inductively coupled plasma mass spectrometer, 7700 ICP-MS coupled with Infinity LC 1260 Series, Agilent Technologies
- Ion chromatograph, ICS 5000 Dionex model, dual channel, conductivity
- Ultra-distilled water production equipment, Millipore, Milli -Q Advantage A20
- X-ray single crystal Diffractometer, Super Nova Diffractometer with two sources (Cu and Mo)
- 500 MHz NMR spectrometer, Bruker Biospin

Publications

1. R.I. Olariu, I. Barnes, I. Bejan, C. Arsene, D. Vione, B. Klotz, K.H. Becker, FTIR product study of the reactions of NO_3 radicals with ortho-, meta-, and para-cresol, Environmental Science and Technology, 47 (2013), 7729-7738.
2. C. Rimbu, R. Danac, A. Pui, Antibacterial Activity of Pd(II) Complexes with Salicylaldehyde-Amino Acids Schiff Bases Ligands, The Pharmaceutical Society of Japan, Chem. Pharm. Bull. 62 (2014), 12–15.
3. A. C. Druc, A. I. Borhan, G. G. Nedelcu, L. Leontie, A. R. Iordan, M. N. Palamaru; Structure-dielectric properties relationships in copper-substituted magnesium ferrites; Materials Research Bulletin, 48 (2013) 4647–4654.
4. C. Dorofteia, P.D. Popa, F. Iacomi, L. Leontie, "The influence of Zn2+ ions on the microstructure, electrical and gassensing properties of La0.8Pb0.2FeO3 perovskite", Sensors and Actuators B, 191 (2014) 239– 245.
5. D.M. Pindaru, C. Tanase, R.I. Olariu, C. Arsene, "Chemical composition and ions concentrations in Xanthoria Parietina and Phaeosphyscia orbicularis lichenised fungi species from Iasi, north-eastern Romania", Revista de Chimie, Bucharest, 64 (2013) 807-814.

6. D.M. Pindaru, C. Tanase, R.I. Olariu, C. Arsene, "Extra and intercellular concentrations of water soluble cations from Xanthoria Parietina and Phaeosphyscia orbicularis lichenised fungi species", Revista de Chimie, Bucharest, 64 (2013) 715-719.
7. O.M. Tucaliuc, I. Cretescu, Gh. Nemtoi, I.G. Breaban, G. Soreanu, O.G. Iancu "Monitoring of Mercury and Urban Dust in the Industrial Area of Iasi Municipality", Environmental Engineering and Management Journal, 2014, IN PRESS.