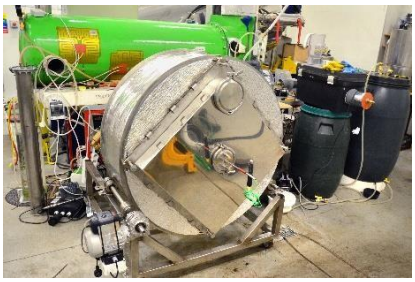
Institute of Environmental Technology

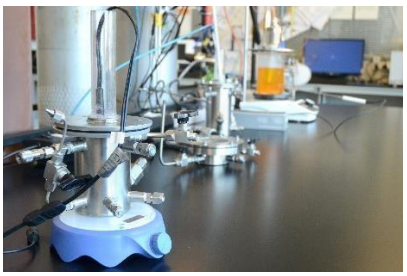
Institute of Environmental Technology (IET) is a research centre, part of the Centre for Energy and Environmental Technologies, VSB – Technical University of Ostrava (VSB-TUO). IET is a scientific-research center, equipped by infrastructure of laboratories and highly qualified teams, focused especially on research of individual technological processes (oxidation, plasma, reduction, anaerobic) of energy recovery of materially non-recoverable, especially mixed, wastes. At the same time the processes and technologies for removal or utilization of waste products (gaseous, liquid, solid) from thermal and anaerobic waste treatments, eventually other similar industrial technologies, and study of impacts of these technologies on the environment are being investigated. IET also participates in the education of students in three master's and seven doctoral study programs accredited at VSB-TUO.

Basic IET activities

- **Energy waste recovery** – pilot plant waste incinerator with continuous two-chamber furnace with the flue gas cleaning system and continuous flue gas monitoring, modular pyrolysis-plasma unit, pilot plant anaerobic reactors (biogas plant models) for wet and dry (co)fermentation.
- **Waste gas and air purification** – research in the area of catalytic reduction of N_2O, NOx, VOC, CO, NH_3 emissions, adsorption of VOC and other substances, testing of catalysts of various scale for reactions in gas phase, photocatalytic cleaning of indoor and outdoor environment.
- **Waste water purification.**
- **Analytical work** – determination of physico-chemical properties of fuels and wastes, qualitative and quantitative analysis of gaseous and liquid mixtures and solids.
- **Chemical engineering calculations, simulations and optimization of industrial processes, studies.**








VSB - Technical University of Ostrava, CEET
INSTITUTE OF ENVIRONMENTAL TECHNOLOGY
17. listopadu 2172/15; 708 00 Ostrava – Poruba
Czech Republic
iet.vsb.cz/en

Analytical servis of IET

Instrumentation	Service (use)
GC YL6100 ECD/FID with auto sampler	Analysis of oxygenated and halogenated products, hydrocarbons
GC YL6100 TCD/FID	Analysis of gaseous products of pyrolysis, permanent gases, hydrocarbons
GC/ MSD ; GC 7890 + MSD 5975, Agilent	Specialized analysis, identification, gases, liquids, thermal desorption
GC/FID/TCD Agilent GC 7890	Analysis of gases, liquids, on-line connection with catalysts' tests
GC/BID/TCD Shimadzu GC Tracera	Trace analysis of gases, liquids, very low detection limits of H_2, CO_2, CO, hydrocarbons etc.
FTIR ANTERIS, Nicolet + 10 ml gas cuvette	On-line and solo analysis of gases, CO, CO_2, NOx etc., air, technological off-gases, catalyst tests
HPLC Shimadzu, detectors UV-VIS + fluorescence	Polyaromates and other semi-volatile and high-boiling substances
Atomic absorption spectrometer AnalytikJena ContrAA 700	Determination of metals in water/leachate/solid sample on AAS – flame, graphite cuvette, range: common metal excluding Hg
Surface plasmon resonance imaging	Interaction of proteins, proteomics, determination of substances in water, pesticides, hormones, metals, PBC
Isotachophoretic – electrophoretic analyzer Villa Labeco ITP EA 102	Isotachophoretic or electrophoretic determination of wide specter of anions in aqueous samples.
Thermogravimetric analyzer TGA 701	Determination of moisture, ash, volatile flammable substance, fixed carbon and approximate flash point values for solids and liquid fuels and waste materials
Semi-automatic calorimeter AC 600	Determination of combustion heat value of solid and liquid wastes and fuels
Elementary analyzer CHSN628	Determination of basic elemental composition (C, H, S, N, O) of solid and liquid wastes and fuels
Total organic carbon analyzer RC612	Determination of total organic carbon in liquid and solid wastes and fuels
X-ray fluorescence spectrometer	Measurement of elements in the range of Na – U, determination of chemical composition of ash, plastics, solids and powder materials, liquids including oils
Porosity analyzer by physical sorption method	Measurement of specific surface area, volume and size distribution of pores of solid materials in the area of micropores and mesopores
Chemisorption analyzer Autochem II	Characterization of catalysts and sorbents – amount of reducible and oxidizable components, amount of acidic and basic centers
Photoelectric spectrometer	Measurements of quantum efficiency of semiconductor materials
X-ray diffractometer	Identification of phase composition of crystalline materials
UV-VIS spectrometer Specord 250Plus	Determination of cyanides – total, ammoniacal nitrogen, nitrates, nitrites, total nitrogen, P-PO_4
Set for determination of BOD and COD	Determination of BOD_5 and COD
Equipment for the volume stability monitoring of waste	Determination test of stability of materials in accordance with certified methodology
Press for the determination of compressive and bending strength	Determination of compressive and flexural strength of materials
Noise analyzer CESVA SC-310	Manual noise analysis and measurement
Infrared spectrometer with Fourier transformation Thermo Nicolet iS10	Qualitative analysis of solid and liquid samples

Process apparatuses of IET

Instrumentation	Servis (use)
Pilot plant anaerobic CSTR bioreactor (fermenter) with a vorking volume of 0.8 m^3. Horizontal to vertical arrangement	Validation tests of biogas production in wet, semi-dry or dry process, discontinuously and semi-continuously
Pilot plant anaerobic horizontal CSTR bioreactor with a working volume of 0.3 m^3	Tests of biogas and methane production in wet, semi-dry or dry process, discontinuously and semi-continuously
Laboratory model anaerobic CSTR bioreactor with a working volume of 0.06 m^3	Tests of biogas and methane production in wet, semi-dry or dry process, discontinuously and semi-continuously
Terrafors IS rotary drum bioreactor with a working volume of 0.01 m^3	Tests of biogas and methane production in wet, semi-dry or dry process, discontinuously and semi-continuously
Set of gas burettes (0.001 m^3), reaction bottles and water baths	Discontinuous tests of residual biogas and methane production from digestate
Vial bioreactors (0.001 and 0.002 m^3) with an incubator	Low volume tests of methane recovery from various substrates and process kinetics
Continuously operating waste incineration furnace (output 30 $kg.h^{-1}$, possibility to incinerate solid and liquid waste) with a followed up technology for flue gas cleaning and emission monitoring	Waste incineration tests with on-line analysis of CO_2, O_2, CO, NO, NO_2, N_2O and SO_2 (before and after the flue gas cleaning system), with continuous measurements of flue gas flow and humidity, with the possibility of sampling for analysis of HCl, HF, heavy metals and PCDD/F (before and after the flue gas cleaning system)
Discontinuously operating waste incineration furnace (output 100 $kg.h^{-1}$, possibility to incinerate solid waste) with a followed up technology for flue gas cleaning and emission monitoring	
Laboratory batch pyrolysis unit	Material and energy balance of pyrolysis of fuels, biomass, waste and other materials. Optimization of pyrolysis process with a related analysis of feedstock as well as solid and liquid products of pyrolysis process
Laboratory microwave batch pyrolysis unit	
Modular system for thermal disposal of hazardous waste (modules: batch and semi-continuous furnace, plasma reactor, catalytic reactor, adsorber, process gas monitoring, heat exchanger)	Research and utilization of combined processes for the disposal of hazardous gaseous substances using plasma and catalysis. Research of conditions for plasma utilization in direct treatment of hazardous gaseous waste.
Catalysts testing unit	Testing of industrial shaped catalysts (tablets, monoliths) and catalysts in powder form for reactions in gas phase, deactivation assessment
Adsorption from gas phase unit	Determination of adsorption capacity of gases and vapors on solid sorbent
Photocatalysts testing unit	Testing of photocatalysts (in powder or thin layer form) for reactions in gas and liquid phase
Photoactive paints testing unit	Testing of photoactive paints for reaction in gas phase according to ČSN ISO 22197
Dip-coating equipment	Preparation of catalytically active thin films (thickness ~ 10-100 nm) by sol-gel method and by dip-coating method
High pressure laboratory unit for work with subcritical and supercritical fluids, equipped with high-temperature cartridges of various volumes	Preparation of powder catalytically active nanostructure materials based on transition metals and lanthanides by sol-gel, precipitation and co-precipitation methods

Contacts

Institute of Environmental Technology
Centre for Energy and Environmental Technologies
VSB - Technical University of Ostrava
17. listopadu 15/2172
708 00 Ostrava-Poruba
Czech Republic

Phone: +420 597 327 301
E-mail: iet@vsb.cz/en
web: iet.vsb.cz
GPS: N 49°50'3.197" E 18°9'42.436"

prof. Ing. Lucie Obalová, Ph.D. - director IET
e-mail: lucie.obalova@vsb.cz

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