



Applied Engineering **in** Brussels

How the University Colleges of Brussels contribute to R&D



By InduTec



InduTec asbl - Technological Transfer Center

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INDUTEC, the Technology Transfer Centre for your Innovation (www.indutec.be)

InduTec is a dynamic Technology Transfer Centre whose mission is to enhance the exchange of technology and innovation between companies and industrial engineering faculties in the Brussels Region. By monitoring projects from concept to implementation, *InduTec* offers promotional opportunities and state-of-the-art experience to those faculties, and enables companies to reap the benefits of a quality science 'business incubator'.

A company's technological knowledge base is the foundation on which internal product and process innovations are generated. However, technological knowledge is not accumulated solely through internal learning processes. Increasingly, companies are turning to external sources in the technology supply chain to acquire the technological know-how they need to introduce product and process innovations. Thus, the successful structuring and executing of partnerships with external "technology source" organizations, such as the Technology Transfer Centre - *InduTec*, is often critical to competitive success in technologically dynamic environments.

The research activities of the industrial engineering faculties in the Brussels Region are future-oriented and innovative. The industrial engineering faculties collaborate with industrial and economic actors in Belgium and abroad through

- contract research (industrial research projects, technical feasibility studies, pre-competitive development, ...)
- economic valorisation (transferring R&D results through existing or new companies)
- protection of intellectual property, licencing agreements, spin-off guidance, ...

It all passes through *InduTec*, that knows how and where to find the appropriate competencies in the industrial engineering faculties to respond to the requests of industry.

If you are looking for new partnerships in managing your technological innovation, do not hesitate to contact our Technology Transfer Centre.

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■ Areas of Expertise

■ Agro-food technologies	52
■ Biotechnological Sciences	62
■ Electronics & ICT	72
■ Industrial Technologies & Material Technologies	81
■ Medicine & Human Health, Electromedical Equipment ...	88
■ Physical Sciences & Measurements	95
■ Protecting Man & Environment	100
■ Rational use of Energy	104
■ Transport Technologies	107





PHYSICAL SCIENCES & MEASUREMENTS

Activities in Physical Sciences and Measurements include:

- Physical and fine chemistry
- The application of physical and physicochemical methods to archeometry
- Nuclear physics, nuclear radiation measurements and monitoring
- Development of tools for acoustic measurements
- Metrology

RECENT RESEARCH PROJECTS

CATACHAR - *development of heterogenous catalysts*

Abstract: The development of heterogenous palladium and nickel catalysts on an active supported carbon medium and a comparison of their effectiveness on specific reactions to pharmaceutical syntheses.

Scientists: V. Dubois (IM).

Partners: Eli Lilly.

Technological Domain & keywords: fine chemistry, colorants, surface chemistry, organic chemistry, heterogeneous catalysis, boundary layers, chemistry, carbon support, palladium, nickel.

VALINCAT - *Catalytic functions of polyunsaturated esters or fatty acids*

Abstract: Catalytic functions of polyunsaturated esters or fatty acids for the oleochemical industry.

Scientists: V. Dubois (IM).

Partners: Université de Poitiers, VANDEPUTTE OLEOCHEMICALS S.A.

Technological Domain & keywords: organic chemistry, natural oils, organic chemistry, fine chemistry, grease, wax, epoxydation, catalyst, vegetable oil.

Archeometry - *Application of physical and physicochemical methods to Archeometry*

Abstract: The application of physical and physicochemical methods to study ancient objects and/or their restoration; study

and implementation of XRFA, PIXE, Raman, Auger and SEM analysis.

Scientists: J. Guillaume (ISIB).

Partners: VUB, ULg, ERM, CVUT Prague, University of Florence, Mariemont Museum, Hanoï Museum, Musée Groothuus, Ethnographic Museum of Paris, Grand municipality, MRAH.

Technological Domain & Keywords: archeometry, non destructive analysis, XRFA, PIXE, Raman, Auger, SEM.

Comparison of LIBS (*Laser Induced Breakdown Spectroscopy*) **and XRF** (*X-ray Fluorescence*) **analysis techniques**

Abstract: Qualitative and quantitative aspects of the comparison between LIBS and XRF analysis techniques on a number of materials and an investigation of their similarities and possible modifications of the technologies used.

Scientists: I. Gerardy (ISIB), J. Guillaume (ISIB).

Partners: Laboratoire de recherche des monuments historiques de France.

Technological Domain & Keywords: archeometry, non destructive analysis.

DONDES - *DOsimétrie Neutronique par DEconvolution Spectrale* - *Neutronic DOsimetry by Spectral DEconvolution*

Abstract: The first objective of the project is to achieve a Monte Carlo simulation of the detection of neutron and gammas rays using scintillation detectors, and to apply the results obtained to deconvolute the spectrum. The second part of the project is to design and set up a prototype that integrates a neutron probe, the calculation of the deconvolution algorithm as well as the calculation of the radiation dose.

Scientists: F. Tondeur (ISIB).

Partners: IRE, UP Valencia, CVUT Prague.

Technological Domain & Keywords: neutron rays, gamma rays, dosimetry, spectrometry, metrology, Monte-Carlo simulation.

Medical dosimetry in brachytherapy

Abstract: A dosimetric analysis of sources of Sr-Y (Strontium-Yttrium) to be used in endovascular brachytherapy to combat the phenomena of restenosis. Application of the Monte Carlo simulation.



Scientists: F. Tondeur (ISIB), I. Gérardy (ISIB)

Partners: Saint-Jean Clinic Hospital, Polytechnic University of Valencia, Novoste s.a.

Technological Domain & Keywords: endovascular brachytherapy, radiation dosimetry, restenosis.

TAHMMRAD - radioactive labelling

Abstract: The radioactive labelling of oil additives for automotive engines in order to be able to monitor their consumption and lifespans.

Scientists: F. Tondeur (ISIB), J. Guillaume (ISIB).

Partners: DSI.

Technological Domain & Keywords: oil additives, radioisotope, radioactive tracers.

Radioactive Tracers

Abstract: Evaluation of the particle filter retention capacity of Fe/Cs present in the EOLYS diesel-fuel additive through the use of radiation labelling. The project has confirmed the high level of Cs retention by the particle filter, and as a result of radioactive labelling an equivalent result has been established for the Fe originating from the additive, thereby differentiating it from the Fe originating from the engine.

Scientists: F. Tondeur (ISIB), I. Gerardy (ISIB), J. Guillaume (ISIB)

Partners: Rhodia electronics and catalysis, France.

Technological Domain & Keywords: additives, diesel, radioisotope, radioactive tracers.

Design and realisation of an acoustic probe with programmable intelligence

Abstract: The acoustic probe possesses the functions of a classic sonometer plus a number of other functions, including the following elements:

- The probe is provided with a weather station. Measurement are made according to VLAREM guidelines and standards governing environmental measurements
- An external clock is provided which allows a number of probes to be synchronised

- The probe is able to anticipate spontaneous actions such as the automatic recording of sound fragments when a certain sound level is reached

- The probe can be operated remotely (data can be collected remotely via an Internet connection)

- The probe is able to send critical statistical data and data on the physical condition of the probe via SMS messages

- The probe features a time-based task manager, which enables pre-programmed unmanned tasks to run autonomously

Scientists: A. Touhafi (EhB), M. Raadschelders (EhB).

Partners: AIB Vinçotte, H.Verhas, RuconVentilatoren, Picanol, WTCB, EVA - international.

Technological domain & Keywords: acoustic probe, environmental acoustics, acoustic engineering, embedded system.

Composition of a virtual tool kit for acoustic measurements

Abstract: In the previous IWT-Hobu funded project, an acoustic probe was developed that focused initially on the measurement of criterion imposed by VLAREM standards. From contacts with industrial partners and during fieldwork it appeared that there is a real need for a measuring instrument that can also undertake a more in-depth analysis of the acoustic signal in addition to the normal parameters. In this context, the following functions were identified: global positioning and direction finding, sound characterization, wavelet analysis of sounds and the determination of echo times by correlation techniques. The functions will all utilise the PC's sound card for data acquisition and PC software for calculations and archiving.

Scientists: A. Touhafi (EhB).



Areas of Expertise



Physical Sciences & Measurements

SPECIALIST EQUIPMENT

METROLOGY LAB

- Profile projector (0,01mm)
- Universal Coordinate Measuring Machine MITUTOYO BX 303 (μm)
- GEOPAK, SCANPAK, TRANSPAK: 3D data analysis and Coordinate Measuring Machines (CMM) programming module
- SGIP Universal Measuring Machine
- Electronic micrometer (0,1 μm)

PHYSICAL CATALYSIS

- BET apparatus for determining specific surface areas (BET method)
- Chemisorption for metal dispersion evaluation
- Liquid phase HP reactor (100 bars)
- Low pressure reactors (atm. 10 bars, 40 bars)
- Solid analysis: TGA, DSC
- Solid characterization: TPO, TPD, TPR
- MALVERN Laser: particle size analysis and micrometry



NUCLEAR RADIATION MEASURING & MONITORING

- Coincidence measurement
- Controlled atmosphere furnaces (Tmax: 1200°C)
- Electrochemical cyclic voltammetry
- Irradiators ^{137}Cs (Gy/min) et ^{60}Co (Gy/min)
- Liquid scintillation
- Neutron measurement: BF₃, stilbène
- Nuclear contamination monitor
- Nuclear Radiation counter: alpha, beta, gamma
- Radiation dosimetry:
 - bubble dosimeter
 - ionisation chambers
 - plastic scintillators
 - proportional counter
 - radiochromic film
 - red perspex
 - thermoluminescent dosimetry
- Radiochemical hoods
- Radon measurement alpha traces, activated carbon, Lucas cells, continuous radon monitor, calibration room
- Spectrometers: alpha, gamma, X, FTIR
- Thermoluminescent measurements
- X-ray fluorescence on samples and in situ
- Zeeman-effect Spectrometer



PUBLICATIONS

IT Unit (EhB)

G. Braeckman, B. Coudron, M. Raadschelders, A. Touhafi and J. Wambacq. "Euterpe: an integrated low cost sonometer". *Book of Abstracts of the 17th International Congress on Acoustics, 2001*.

M. Raadschelders. "Ontwerp en realisatie van een akoestische sonde met programmeerbare intelligentie". Resultaten van HOBUFONDSPROJECT nr 990068, *InduTec News*, 2001.19.

M. Raadschelders. "Hogere Akoestiek". *Ingenieursmededelingen, maandblad van de Vlaamse Ingenieurskamer, 2002,40*.

G. Braeckman, M. Raadschelders, A. Touhafi. "Implementation of a generic virtual instruments environment for acoustic measurements". *Proceedings of the International Seminar on Modal Analysis, ISMA, 2002*.

Nuclear Physics & radiation laboratory (HEPHS - ISIB)

F. Tondeur. "Mapping indoor radon in the Walloon region: kriging vs. moving average". International 11th IAMG Annual Conference on Quantitative Geology from Multiple Sources. *Liège, 3-8 Sep. 2006*.

F. Tondeur. "Geostatistical mapping of indoor radon data with kriging using geological data". *8th International Workshop on the Geological Aspects of Radon Risk Mapping, Prague, 26-30 Sep. 2006*.

C. Mertens, C. de Lellis, P. van Put and F. Tondeur. "MCNP Simulation and Spectrum Unfolding for an NaI Monitor of Radioactivity in Aquatic Systems". *10th International Symposium on Radiation Physics, Coimbra, 17-22 Sep. 2006*.

S. Gallardo, I. Gerardy, J. Rodenas, N. Rasson, M. Van Dycke and F. Tondeur. "Simulation of the dose distribution for a brachytherapy source of Ir-192 using the Monte Carlo method". *1st European workshop on Monte Carlo Treatment planning, Gent, 22-25 October 2006*.

Physical Chemistry and Catalysis Unit (HELDB - IM)

S. Hermans, C. Diverchy, O. Demoulin, V. Dubois, E.M. Gaigneaux and M. Devillers, *J. Catal.* **243** (2006) 23. "Nanostructured Pd/C catalysts prepared by grafting of model carboxylate complexes onto functionalized carbon"

C. Diverchy, S. Hermans, V. Dubois and M. Devillers in "Scientific Bases for Preparation of Heterogeneous Catalysts" (E. Gaigneaux et al, eds), Elsevier, Amsterdam, *Stud. Surf. Sci. Catal.*, **163** (2006) 569. "Grafting of coordination compounds onto functionalized carbon supports as precursors for bimetallic Pd-Ru/C catalysts".



Areas of Expertise



Physical Sciences & Measurements

N. Bouchenafa-Saïb, P. Grange, P. Verhasselt, F. Addoun and V. Dubois, Appl. Catal. A: General, **286** (2005) 167. *"Effect of oxidant treatment of date pit active carbons used as Pd supports in catalytic hydrogenation of nitrobenzene"*.

M.M.V.M. Souza, L. Clavé, V. Dubois, C.A.C. Perez and M. Schmal. Appl. Catal. A: General, **272** (2004) 133. *"Activation of supported nickel catalysts for carbon dioxide reforming of methane"*.

V. Dubois, Y. Dal and G. Jannes in "Scientific Bases for Preparation of Heterogeneous Catalysts" (E. Gaigneaux et al, eds), Elsevier, Amsterdam, Stud. Surf. Sci. Catal., **143** (2002) 993. *"Active carbon surface oxidation to optimize the support functionality and metallic dispersion of a Pd/C catalyst"*.

