"Nature produces polysaccharides, EPNOE turns them into materials"

European Polysaccharide
Network Of Excellence

Erasmus IP-programme 2008-2011

"Sustainable Utilization of Renewable Resources"

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The two week Intensive Program (IP) called "Sustainable Utilization of Renewable Resources" will take place in Graz, Austria on three summers in a row starting from 2009. Similar Intensive Programs have been organised before with the same concept, and they have proven to be a success. The IP is meant for students aiming for a Masters degree or for first year PhD students.

Partners

Project coordinator: Prof. Dr. Anton Huber, Graz University, Institute for Chemistry
15 partners:

- Ecole des Mines de Paris / CNRS, Centre for Material Forming, ARMINES, PCP - Polymer Chemical Physics, France
- Universiteit Gent, Faculty of Bioscience Engineering, Organic Chemistry, Belgium
- Friedrich Schiller Universität Jena, Centre of Excellence for Polysaccharide Research, FRG
- Universität für Bodenkultur Wien, Department of Chemistry / Group Plant Carbohydrates, Austria
- Institut National Polytechnique de Toulouse, Laboratoire de Chimie Agro-Industrielle, France
- ustus-Liebig Universität Giessen, Research Centre for Biosystems, Land use and Nutrition, FRG
- Abo Akademi University, Faculty of Technology (TkF) / Department of Chemical Engineering, Finland
- KTU - Kaunas University of Technology, Faculty of Chemical Technology (TkF), Lithuania
- University of York, Department of Chemistry / Green Chemistry Group (GCG), UK
- Universität Hamburg, Department of Wood Science / Dividsion of Wood Biology, FRG
- University Maribor, Laboratory for Characterisation and Processing of Polymers, Slovenia
- Wageningen University and Research Centre, AAFSG - Agrotechnology & Food Sciences Group, The Netherlands
- University of Nottingham, Division of Food Science / School of Biosciences, UK
- Universität Innsbruck, Research Institute for Textile Chemistry and Textile Physics, Austria
- Utrecht University, Department of Science, Technology and Society (STS) / Copernicus Institute, The Netherlands

Objectives

The IP 'Sustainable Utilization of Renewable Resources' communicates the state of the art of geographically dependent production and utilization of renewable resources of major and minor quantities for food and non-food products. The dependence of ecology and economy of applied processing approaches will be covered as well as the arising competition between agro-based energy and demand for nutrition.

Target Group

Target audience will be MSc (or equivalent) students of chemistry, agricultural sciences, chemical and material engineers, food sciences and environmental sciences.
The course additionally suits for the initial level (1st year) in graduate or Doctoral schools. Target group for teaching are staff-members from the list of IP-partners.

Main Activities

Organizing and running a 2-week 7 ECTS IP program on 'Sustainable Utilization of Renewable Resources' for 60 students (nominated by the IP-partners or equivalent) provided by an expert group of approx. 20 teachers.

Expected Output

Evaluation and maintenance of material presented in the IP, editing selected material for ICT utilization, at least for the partners in the IP. Initiating a network of educational activities on the interface between Master and PhD level focused on Sustainable Utilization of Renewable Resources with the grid resembled by the IP-partners.

Rationale and background

Utilization of Renewable Resources becomes increasingly important for several reasons, the major arguments however may be:

• economically, as alternatives for petrochemical resources are needed but even for 'export (dissemination) of know how' of sustainable handling of biological resources instead of 'export of value added goods' made from imported raw materials.

• ecologically, as renewable resources are available ubiquitous and hence, may decrease dependence of local communities on imported goods and energy and might increase awareness on local based, however global equilibria.

• and last but not least, socially, as acceptance for local options (goods and energy) is high due to closer contact to raw materials, producers, manufacturers and the fact, of chances for more high-level working options in local areas.

An estimation of the annual formed quantity of Renewable Resources reads:

Annually assimilated biomass	**Specification**	**10^9 tons (Gt) dry matter annually**	**%**
carbohydrates (CH) / polysaccharides (PS)	glycosidically linked	~75-300	~75
	non-branched, β(1→4)-linked glucans	cellulose: 50-200	~45% of CH/PS
		hemicellulose: 20-100	~20-25% of CH/PS
	α(1→4)-linked + α(1→6)-branched glucans	starch: 1-5	~2-5% of CH/PS
	others	xylans, mannans, galactans, fructans, ...	
lignin	polyphenolic compounds	~20-80	~20
amino acids (AS) / proteins	peptidic linked amino acids	~2-8	~2
others such as nucleic compounds,RNA,DNA, ATP, GTP, ...	phosphate ester-linked purin / pyrimidin nucleosids	~2-8	~2
lipids / hydrophobic compounds		~2-8	~2

Expertise in sustainable utilization of these resources therefore needs particular focus on biopolymers in general and on polysaccharides in particular.

Aims / Objectives of the project

The IP 'Sustainable Utilization of Renewable Resources' communicates the state of the art of geographically dependent production and utilization of renewable resources of major and minor quantities for food and non-food products. The dependence of ecology and economy of applied processing approaches will be covered as well as the arising competition between agro-based energy and demand for nutrition. Ecological footprints and Life Cycle Assessments (LCA) will provide

information on quality of various technological approaches. Communities, regional organizations and enterprises will demonstrate and argue the pros & cons of their approaches on excursions.

Contribution of the partners

Karl-Franzens University Graz (KFUG) is a general university with faculties ranging from Theology, Law, Social and Economic Sciences, Arts and Humanities to Natural Sciences. Major activities of KFUG are tertiary level education (Bachelor, Master, PhD Programmes) and as well basic as applied research in any discipline. The Institute of Chemistry (IfC) is a unit within Natural Science Faculty of KFUG and has a long tradition in providing Diploma-, Bachelor-, Master- and PhD-study Programmes in the field of Natural Sciences with particular emphasis on General Chemistry, Renewable Resources and Material Sciences. KFUG is partner in many international networks, participates in international activities and hosts international events.
KFUG, in particular IfC
• runs within NAWI Graz a regular Master Programme on 'Technical Chemistry; Renewable Resources'
• runs a regular Master Programme on 'Environmental System Sciences / Chemistry'
• was partner in several EU PROG IPs on Chemistry and Technology of Bioresources (headed by Univ Gent during 2002-2006)
• hosts an IP Renewable Bioresources and Biorefineries in 2008
• is one out of 3 EU-partners in an EU-US project on Higher Education and Vocational Training 'Renewable Resources and Clean Technology'
• on local / regional basis is co-initiator of NUBIOR (NUtzung BIOgener Rohstoffe), a research and technolgy network located in Styria, however international focus, to stimultate efficient and sustainable utilization of biogenic raw materials.
Leading contact groups / staff:
• Prof. Dr. Anton Huber, IfC / head of CePoL/MC (Inst.f.Chem. / Central Polymer Lab - Molecular Characteristics); Head of Curricula commission 'Envionmental System Sciences'
• Prof. Dr. Martin Mittelbach, IfC / head of Renewable Resources; head of Curricula Commission 'Chemistry'

The majority of the partners already have implemented programmes, or at least modules, on renewable resource topics. In the framework of PROG IPs in the period 2002-2006 a network of 4 universities (Gent, Vienna, Graz, York) additionally developed a curriculum on 'Renewable Bioresources'. In addition Gent University is the co-ordinator of an EU-US programme 'Renewable Bioresources and Clean Technology' (2004-2008) with the partners: Gent, Graz, Toulouse in EU and Iowa State University, University of Arkansas and University of Washington in the US.
A number of IP-partners are partners in EPNOE (European Polysaccharide Network of Excellence) since several years. 2006/07 EPNOE installed an Education Task Force with a major focus on academic education, in particular on contributions to the interface 'Master/ Doctoral School'-Education. All of these partners provide perfect research-based know how for contributions to the IP and for administration, dissemination and monitoring of the IP.
Additionally, EPNOE is a window for non-EUC-accredited partners, in particular pure research facilities with focus on biological resources
- German Fraunhofer Institut for Applied Polymer Research in Potsdam (focus on: modification of cellulose and starch, hemicellulose, inulin, hyaloronic acid, chitin and chitosan; super molecular and morphological characterisation, mechanical and rheological characterisation;),
- Finish VTT (focus on: screening, characterization, engineering and production of novel enzymes for modification of lignin, cellulose, hemicellulose and chitin; modification of cellulosic and lignocellulosic fibres and lignocellulose-derived polymers; up-scaling of modification processes)
- Polish Institut of Biopolymers and Chemical Fibres in Lodz (focus: fibres from naturla polymers, spciality fibers, biomaterials)
- and Romanian Academi Petru Poni Research Institut on Macromolecular Chemistry in Iasi (production of saccharide copolymers; blends of polysaccharides with lignin and synthetic polymers; wood waste synthetic polymers composites; cellulose and hemicellulose synthetic polymers interactions; medical/pharmaceutical and cosmetic applications: intelligent drug delivery systems), and to business and industrial units due to the fact that EPNOE 2007 initiated a Business and Industry Club (BIC) with focus on biological raw materials, in particular polysaccharides.

Partners from former PROG IP and/or running Atlantis projects on Renewable Resources:
BOKU Vienna, University Gent, INP Toulouse, JL-University Giessen, Kaunas University of Technology, University of York, Wageningen University and Research Centre;
Partners from running EPNOE (European polysaccharide network of Excellence) projects:
Ecole des Mines de Paris / CNRS Centre for Material forming, FS-University Jena, BOKU Vienna, Abo Akademi University, University of Hamburg, University Maribor, Wageningen University and Research Centre, University of Nottingham, Universität Innsbruck, University Utrecht.

The Organizing Committee will invite the IP-partners to send staff members to participate with lectures, workshops, seminaries and other means in the IP.

The Erasmus IP program is a very good opportunity for Master students and first year PhD students to learn something new within the field of renewable resources not offered solely by their own university. These two weeks offer a great opportunity for networking, both for students and teachers.

Practical information about the agenda for the next IP, how to send students to the IP etc. will be distributed to you next spring in 2009.

For more information about this Erasmus IP 2008-2011, please do not hesitate to contact us!

Best regards,

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