



Interuniversity Consortium "Chemistry
for the Environment" (INCA)



Alma Mater Studiorum
University of Bologna

European Summer School

**"Production of fuels, specialty chemicals and biobased
products from agro-industrial wastes and surplus"**

**Faculty of Engineering, *Alma Mater Studiorum*-University of Bologna
Bologna, Italy**

September 4-9, 2006

Directors:

**Prof. Fabio Fava, *Alma Mater Studiorum*-University of Bologna
Prof. Pietro Canepa, INCA & University of Genoa**

Organized and sponsored by:

University of Bologna & Interuniversity Consortium INCA

Co-sponsors:

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INTRODUCTION

The chemical industry developed over the past century using petroleum as its primary feed-stock. A number of economical, political and social forces are now leading the chemical industry to consider renewable plant-based feed-stocks in addition to/instead of petroleum, which is going to be available on the market at acceptable costs only up to 2040. Agro-industrial wastes, residues and surplus, which are generated at amounts higher than 100 trillions kg per year, provide a low-cost and uniquely sustainable resource for production of some fuels and chemicals currently produced from fossil sources. Bio-based products obtainable from such sources fall generally into three categories: a) commodity chemicals, including fuels such as ethanol, methane, hydrogen along with aldehydes, carboxylic acids, etc.; b) specialty chemicals, such as amino acids, vitamins, antioxidants, flavours and fragrances, chiral compounds, etc. and c) biomaterials, such as biopolymers, cellulose, oils, proteins, lignin, etc. Some of these products are directly obtained from the agro-industrial wastes or surplus through tailored recovery procedures whereas others are obtained through chemical, physical or/and biological processing of the main biomass components.

The costs of bio-based products are often relatively high, mostly for the fact that the industry dealing with their production is still underdeveloped and dominated by processing costs. Such costs can be significantly reduced by intensifying the research and development activities in the field. This in turn requires the education of the public and policymakers and in particular of the personnel involved in the product and process design and development. In fact, such processes generally consist of a sophisticated combination of different principles and instruments of the modern biology, chemistry and engineering sciences, and therefore their design, development, and management require a broad and interdisciplinary background that is often not provided by the current EU University programs.

This school is specifically addressed to provide to 40 selected scientists and engineers a critical overview on the industrial processes currently applied to produce bio-based products from agro-industrial wastes and surplus and on the main objectives and challenges of the research in progress in this field.

PROGRAM

MONDAY SEPT. 4, 2006

Registration

12.00-15.00 Registration of participants

Introductory remarks

15.00-15.30 Welcome and opening remarks

Prof. Fabio Fava (Summer School Co-Director, University of Bologna, Bologna, Italy)

Prof. Guido Masetti (Dean of the Faculty of Engineering of the University of Bologna, Bologna, Italy)

Prof. Pietro Canepa (Vice-Director of INCA & Summer School Co-director, University of Genoa, Genoa, Italy)

Prof. Luciano Morselli (Coordinator of *Laurea* degree and Master programs in Waste Management and of the LITCAR Lab, University of Bologna, Italy)

Main features and potential of agroindustrial wastes and surplus

15.30-16.50 Agriculture residues and agro-industrial wastes and wastewaters: their origin, characteristic and potential in the biobased-compounds production

Prof. Maurizio Petruccioli, University of "La Tuscia", Viterbo, Italy.

16.50-17.20 Coffee break

17.20-19.00 The third wave of Biotechnology: bulk chemicals, fine chemicals and bio-energy from renewable resources

Prof. Danilo Porro, University of Milano-Bicocca, Italy

Get together party

TUESDAY SEPT. 5, 2006

Recovery and valorisation of specialty chemicals from agro-industrial wastes and surplus

9.00-10.15 Recovery of bioactive compounds from food processing wastes

Prof. Leonardo Setti, University of Bologna, Italy

10.15-10.45 Coffee break

10.45-11.45 Recovery of biotin from wastes of sugar producing plants

Prof. Giovanni Camera Roda, University of Bologna, Italy

11.45-13.00 Utilization of viticulture pollutant wastes for obtaining food additives

Prof. José Manuel Dominguez Gonzalez, University of Vigo, Spain

13.00-15.00 Lunch and poster viewing

15.00-16.15 Production of organic fertilizers from organic municipal and agroindustrial waste

Dr. Sergio Piccinini/Dr. Lorella Rossi, Centro Ricerche Produzioni Animali, Reggio Emilia, Italy

16.15-16.45 Coffee break

Production of biofuels from agroindustrial wastes and surplus

16.45-18.15 Biodiesel: production from wastes and perspectives

Prof. Martin Mittelbach, University of Graz, Austria

WEDNESDAY SEPT. 6, 2006

Production of fuels from agro-industrial wastes and surplus (continued)

9.00-10.15 Methane production from the organic wastes: basics and application

Prof. Franco Cecchi, University of Verona, Italy

10.15-10.45 Coffee break

10.45-12.00 Effect of process configuration, substrate complexity and environmental factors on the biomethane production via anaerobic bioprocesses

Prof. Nuri Azbar, Ege University, Bornova-Izmir, Turkey

12.00-13.00 Intensified processes for the methane production from olive mill wastewaters

Prof. Fabio Fava, University of Bologna, Italy

13.00-14.30 Lunch and Poster viewing

14.30-16.00 Production of hydrogen from biomass through chemical approaches

Dr. Claude Mirodatos, CNRS of Lyon, France

16.00-16.30 Coffee break

16.30-18.00 Biological production of hydrogen from agroindustrial by-products and energy crops

Dr. Astrid Mars, Agrotechnology and Food Innovations, Wageningen, The Netherlands

THURSDAY SEPT. 7, 2006

Production of fuels from agro-industrial wastes and surplus (continued)

9.00-10.30 Microbial fuel cells relative to other fermentations for biomass to energy conversions

Prof. Willy Verstraete, Ghent University, Belgium

10.30-11.00 Coffee break

11.00-12.30 Bioethanol production from lignocellulosic raw materials

Prof. Bärbel Hahn-Hägerdal, University of Lund, Sweden

12.30-14.15 Lunch and Poster viewing

Production of other biobased-products from agro-industrial wastes and surplus

14.15-15.30 Polyhydroxyalkanoates (PHA) production by mixed cultures: fundamentals and applications

Prof. A. Maria A. Reis, University Nova di Lisboa, Portugal

15.30-16.45 Olive oil mill wastewater as a renewable feedstock for production of biodegradable polymers through an anaerobic/aerobic process

Proff. Mario Beccari, Mauro Majone, Davide Dionisi, University of Rome "La Sapienza", Italy

16.45-17.10 Coffee break

17.10-19.00 Green Chemistry and bio-oxidative methodologies for the valorisation of compounds present in agriculture wastes and wastewaters

Prof. Enrico Mincione/Dr. Roberta Bernini University of Viterbo & Prof. Andrea Scozzafava, University of Firenze, Italy

FRIDAY SEPT. 8, 2006

Production of other biobased-products from agro-industrial wastes and surplus (continued)

9.00-10.30 Carbohydrates as organic raw materials: availability, present uses and future development lines

Prof. Frieder W. Lichtenthaler, Technical University of Darmstadt, Germany

10.30-11.30 Production of optically pure molecules by biotransformation of agro-food wastes

Prof. Francesco Molinari, University of Milan, Italy

11.30-12.00 Coffee break

12.00-13.00 Production of flavours from agriculture wastes and surplus

Prof. Maurizio Ruzzi, University of Viterbo, Italy

13.00-14.00 Lunch

14.00-15.00 Production of microbial enzymes on agriculture residues and agro-industrial wastes and wastewaters

Prof. Federico Federici, University of Viterbo, Italy

15.00-16.00. Microalgae as cell factories for biochemical products and energy

Dr. Giuseppe Torsillo, CNR, Istituto per lo Studio degli Ecosistemi, Firenze, Italy

16.00-17.00. Complex waste-less technology for an integrated sugar beet valorisation

Prof. Z. Bubník, Prof. K.- Demnerová, Prof. J. Pazlarová, Institute of Chemical Technology, University of Prague, CZ

17.00-17.30 Coffee break

Poster section and conclusive remarks

17.30-18.30 Selected Poster presentation

(Coordinator: Dr. Diana Di Gioia)

SATURDAY SEPT. 9, 2006

9.00-11.00 White biotech Industry: state-of-the-art in Italy and in the enlarged Europe

9.00-9.45 Bioenergy from renewables: challenges and opportunities.

Dr. Francesca de Ferra, ENI Tecnologie, San Donato Milanese, Italy

9.45-10.30 Biodegradable and Bio-based polymers for the environment

Dr. Francesco Degli Innocenti, NOVAMONT S.p.A., Novara, Italy

10.30-11.00 Long term experiences of Marcopolo Environmental group in the bioenergy production from biomass and renewable sources.

Ing. Luca Brondello, Marcopolo Environmental Group, Borgo S. Dalmazzo Cuneo, Italy

11.00-11.15 Coffee break

11.15-12.00 Industrial Biotechnology in Europe and Member States: Technology Platform and implementation

Dr. Camille Burel, EuropaBio, Brussels, Belgium

12.00-12.15 Conclusive Remarks

(Coordinators: Prof. Fabio Fava, Prof. Pietro Canepa)

12.15-12.40 Final test for ECTS assignment (only for those participants who will require it).

WHO CAN ATTEND THE SCHOOL

Forty young scientists and engineers possessing a PhD, MS or *Laurea* degree and working at Universities, public and private research Centres or private Companies along with 5 professionals can participate in the school. Ten (of the 40) positions will be reserved to scientists and engineers from Eastern and South European and non-European Countries. Participants will be selected on the basis of their *Curriculum vitae* and documented experiences in the field objective of the school. Participants are encouraged to present their activities through one or more posters (1 m x 0,70 m) which will be viewed and discussed during the school; a 1-page A4 abstract related to each poster should be submitted by e-mail (along with the *Curriculum vitae* and the application form) at the following addresses: diana.digioia@unibo.it AND serena.capodicasa@mail.ing.unibo.it, as they will be published in the final book of the school presentations. The University of Bologna will assign 3 (three) European Credit Transfer System (ECTS) to those participants who will submit an abstract and present a poster at the school or pass the final school test. The official language of the school is English. Presentations, papers and all the other documents provided will be in English.

REGISTRATION

Registration fee is €550. Ten fellowships of €200 each will be provided to selected participants coming from Eastern and South European and non European Countries. The registration fee includes: a copy of the teaching material, a copy of the final book (that will be published within 6 months after the end of the School), along with coffee breaks and lunches from Monday 4 afternoon to Saturday 9 morning and the accommodation of participants from the 4th to the 9th of September, 2006.

People interested in participating in the school should send an e-mail with all their data and a *Curriculum vitae* to the following e-mail addresses: diana.digioia@unibo.it AND serena.capodicasa@mail.ing.unibo.it before July 15, 2006. Selected participants will be reached by e-mail by July 25, 2006 and they must pay the registration fee (by transferring it to the account that will be indicated in the e-mail message) and send their abstracts by August 5, 2006. Cancellation refunds will be made for written cancellations received by the school secretariat prior to August 15, 2006. No refunds will be made for cancellations after this date, but the final summer school book will be mailed.

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