

MONITORING PROGRESS REPORT

**COST**

Domain Committee "Forests, their Products and Services"

**COST Action E41**

*Analytical tools with applications for wood and pulping chemistry*

**MONITORING  
PROGRESS REPORT**

***Period:*** from 07/06/2004 to 06/06/2008

This Report is presented to the relevant Domain Committee and contains two parts:

- I. Management Report*** prepared by the COST Office
- II. Scientific Report*** prepared by the Chair of the Management Committee of the Action

The report is a "cumulative" report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.C. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year's budget allocation.

## I. Management Report prepared by the COST Office

### I.A. COST Action Fact Sheet

- **COST Action** E41 - Analytical tools with applications for wood and pulping chemistry
- **Domain** Forests, their Products and Services

- **Action details:**

**CSO Approval:** 04/12/2003

**End date:** 06/06/2008

**Entry into force:** 18/03/2004

**Extension:**

- **Objectives**

The main objective of the Action is to develop and evaluate analytical methods related to wood, pulping and bleaching chemistry. The Action will evaluate the potential and restrictions of the presently available chemical analytical methods for wood and pulp fiber and fiber components and develop further the presently available chemical analytical methods for wood and pulp fiber and fiber components. The Action will also evaluate the potential of the analytical methods even for non-woody lignocellulosic raw materials used by the pulp and paper industry

- **Signatories:**

#### Parties: list of countries and date of acceptance

Country	Date	Country	Date	Country	Date	Country	Date
Austria	18/03/2004	Croatia	27/06/2005	Denmark	18/03/2004	Finland	25/03/2004
France	09/06/2004	Germany	18/03/2004	Hungary	17/10/2004	Italy	16/04/2004
Latvia	18/03/2004	Netherlands	25/03/2004	Norway	07/10/2004	Portugal	10/09/2004
Romania	15/06/2004	Slovenia	25/08/2004	Spain	15/06/2004	Sweden	18/03/2004
Switzerland	18/03/2004	United Kingdom	18/03/2004				
Total:	18						

- **Intentions to sign:**

#### Intentions to accept: list of countries and date

Country	Date	Country	Date	Country	Date	Country	Date
United States	18/03/2004						
Total:	1						

- **Participating Institutes of non-COST countries:**

**Other participants**

Department of Wood and Paper Sciences, North Carolina University, Raleigh (US)

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- **Action Web site:** <http://www.vtt.fi/proj/coste41>

- **Grant Holder:**

- **Working Groups**

**Working Group 1:** Characterisation of lignin.

**Working Group 2:** Characterisation of polysaccharides.

**Working Group 3:** Characterisation of extractives.

### ***I.B. Management Committee member list***

<b>Country</b>	<b>MC Member</b>	<b>Email</b>
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United Kingdom

Dr. Callum HILL

United States

Professor Dimitris S.  
ARGYROPOULOS

## I.C. Overview activities and expenditures

### 2008 Budget

Total Action Budget	81000.00
Remaining Action Commitment	3203.65

#### Meetings

Meeting Type	Date	Place	Cost	Status	Total
Working Group	21/11/2007	Bled (SI)	18,901	PAID	
Others	14/02/2008	Espoo (FI)	2,560	APPROVED	
Joint MC/WGs	19/05/2008	Turku (FI)	38,400	APPROVED	
					<b>59,861</b>

#### STSM

Beneficiary	Date	From	Cost	Status	Total
Ms Edita Jasiukaityte	12/11/2007	Ljubljana (SI)	2,010	APPROVED	
Ms ANNABELLE CARON	7/01/2008	Glasgow (GB)	2,325	APPROVED	
					<b>4,335</b>

#### Workshops

Title	Date	Place	Cost	Status	Total
MC + WGs meeting	21/11/2007	Bled (SI)	3000	APPROVED	
					<b>3000</b>

#### General Support Grants

Title	Date		Cost	Status	Total
General	21/11/2007		2000.00		
					<b>2000.00</b>

#### Schools

Title	Date	Place	Cost	Status	Total
M. Analytical Tools for P&P	5/11/2007	Abo (FI)	8600		
M. Analytical Tools for P&P	15/11/2007	Turku (FI)	0		
					<b>8600</b>

**Action Total 77796.35**

## 2007 Budget

Total Action Budget	49000.00
Remaining Action Commitment	1328.49

### Meetings

Meeting Type	Date	Place	Cost	Status	Total
Working Group	19/03/2007	Hamburg (DE)	4,504	PAID	
Management Committee	7/05/2007	Rome (IT)	34,062	PAID	
					<b>38,567</b>

### STSM

Beneficiary	Date	From	Cost	Status	Total
Ms Anna Andersone	27/03/2007	Riga (LV)	1,815	APPROVED	
Dr Anne-Laurence Dupont	19/02/2007	Paris (FR)	950	APPROVED	
Dr Clemens Altaner	22/01/2007	Glasgow (GB)	730	APPROVED	
Dr Maija Mattinen	18/03/2007	Espoo (FI)	1,860	APPROVED	
Mr Martin Zenker	14/05/2007	Hamburg (DE)	750	APPROVED	
					<b>6,105</b>

### Workshops

Title	Date	Place	Cost	Status	Total
MC/WG + Workshop	7/05/2007	Rome (IT)	3000	APPROVED	
					<b>3000</b>

### General Support Grants

Title	Date		Cost	Status	Total
					<b>0</b>

### Schools

Title	Date	Place	Cost	Status	Total
					<b>0</b>

**Action Total 47671.51**



## 2006 Budget

Total Action Budget

75000.00

Remaining Action Commitment

10428.08

### Meetings

Meeting Type	Date	Place	Cost	Status	Total
Management Committee	1/03/2006	Hamburg (DE)	1,392	PAID	
Working Group	12/04/2006	Grenoble (FR)	9,797	PAID	
Management Committee	31/08/2006	Vienna (AT)	30,257	PAID	
Management Committee	20/11/2006	02151 Espoo (FI)	1,976	PAID	
					<b>43,422</b>

### STSM

Beneficiary	Date	From	Cost	Status	Total
Ms SIMONA PETERLIN	19/03/2006	Ljubljana (SI)	2,050	APPROVED	
Ms Iamarino Giuseppina	21/01/2006	Portici (IT)	2,500	APPROVED	
Dr Ildiko Mohammed-Ziegler	26/03/2006	H-2510 Dorog (HU)	850	APPROVED	
Mr Jorge Rencoret	15/06/2006	Seville (ES)	2,500	APPROVED	
Ms Ute Henniges	23/01/2006	A-1190 Wien (AT)	1,900	APPROVED	
Mr Thomas Ters	1/04/2006	Vienna (AT)	2,000	APPROVED	
Mr Heiko Winter	8/05/2006	Hamburg (DE)	1,500	APPROVED	
Dr Zoltán Hórvölgyi	19/03/2006	Budapest (HU)	850	APPROVED	
Ms Anni Kilpeläinen	5/11/2006	Espoo (FI)	2,500	APPROVED	
Mr Richard Gosselink	20/11/2006	Wageningen (NL)	2,500	APPROVED	
					<b>19,150</b>

### Workshops

Title	Date	Place	Cost	Status	Total
					<b>0</b>

### General Support Grants

Title	Date	Cost	Status	Total
General	3/10/2006	2000.00		
				<b>2000.00</b>

### Schools

Title	Date	Place	Cost	Status	Total
Wood Extractives in Pulp and	12/12/2006	Abo (FI)	0		
					<b>0</b>

**Action Total 64571.92**

## 2005 Budget

Total Action Budget	74197.00
Remaining Action Commitment	-18293.07

### Meetings

Meeting Type	Date	Place	Cost	Status	Total
Management Committee	2/02/2005	Wageningen (NL)	2,505	PAID	
Workshop/Conference	4/04/2005	Stockholm (SE)	2,510	PAID	
Management Committee	24/04/2005	Barcelona (ES)	45,410	PAID	
Working Group	6/11/2005	Stockholm (SE)	27,935	PAID	
					<b>78,360</b>

### STSM

Beneficiary	Date	From	Cost	Status	Total
Carmen-Mihaela Popescu	31/05/2005	Iasi (RO)	1,200	APPROVED	
Olena Sevastyanova	5/03/2005	Stockholm (SE)	1,186	APPROVED	
					<b>2,386</b>

### Workshops

Title	Date	Place	Cost	Status	Total
MC/WG/Open Workshop	24/04/2005	Barcelona (ES)	8743.91	APPROVED	
Working Group and open wo	6/11/2005	Stockholm (SE)	3000	APPROVED	
					<b>11743.91</b>

### General Support Grants

Title	Date		Cost	Status	Total
					<b>0</b>

### Schools

Title	Date	Place	Cost	Status	Total
					<b>0</b>

**Action Total 92490.07**

## 2004 Budget

Total Action Budget	68900.00
Remaining Action Commitment	-7456.19

### Meetings

Meeting Type	Date	Place	Cost	Status	Total
Management Committee	7/06/2004	Brussels (BE)	14,282	PAID	
Others	3/09/2004	ESPOO (FI)	3,178	PAID	
Management Committee	21/10/2004	Espoo (FI)	50,321	PAID	
					<b>67,781</b>

### STSM

Beneficiary	Date	From	Cost	Status	Total
					<b>0</b>

### Workshops

Title	Date	Place	Cost	Status	Total
MC/WGs	21/09/2004	Espoo, Otaniemi (FI)	8575	APPROVED	
					<b>8575</b>

### General Support Grants

Title	Date		Cost	Status	Total
					<b>0</b>

### Schools

Title	Date	Place	Cost	Status	Total
					<b>0</b>

**Action Total      76356.19**

## ***II. Scientific Report prepared by the Chair of the Management Committee of the Action***

### ***II.A. Results achieved during the period 7.6.2004 to 31.12.2007***

The mid-term evaluation of the Action was performed during the meeting of the Action in August/September 2006. As a result of the evaluation, it was concluded that the Action is well on the track towards reaching its objectives, even if the description of the objectives are written in a general way. The main objective of the Action is to develop and evaluate analytical methods related to wood, pulping and bleaching chemistry.

A new activity was initiated in the Barcelona meeting in April 2005. That is a joint analysis effort, focused on selected samples. The background for initiating this was that it was regarded to be crucial to have the same samples analysed with the various analytical methods. The joint analysis effort covers all WGs, i.e, all fiber components. Thus, as an outcome, a huge amount of data will be created, which serves as a basis for evaluating the performance of the various analytical techniques applied in different laboratories. Earlier, this kind of evaluation has not been possible, since the variation in samples has made it impossible to compare the performance of the methods as such. The outcome of this evaluation is well in line with the main objective of the Action. In the mid-term evaluation, the joint analysis effort was regarded to be a very valuable activity that should be continued.

Since the initiation of the joint analysis effort, participating laboratories have presented their results related on the chosen samples in the workshops and WG meetings in 12.-13.4.2006, Grenoble, France and 31.8.-1.9.2006, Vienna, Austria. That was one of the topics also in the workshop in Rome, Italy, on 7.-8.5.2007. The WG leaders coordinate the compilation of the results in such a way that the synergy of the cooperation is attained.

In addition to the above mentioned analysis activity, other topics have been highlighted in the workshops: Industry-related, especially on-line analysis methods (Bled, Slovenia Nov 2007), sample preparation (Vienna 2006), spectrometric techniques (Barcelona 2005) and chromatographic techniques (Stockholm 2005). This has enabled the active participation of even those laboratories that do not take part in the joint analysis effort. In addition, one of the aims of the Action is to cover the field of chemical analysis techniques in a wide sense to ascertain that all emerging techniques will be evaluated for their potential for chemical fiber characterisation.

Europe is strong in the research field covered by the Action. Thus, the outcomes of the Action are at high scientific level even in international comparison. In addition, the Action has a very active non-COST member, North Carolina State University (NCSU), which is one of the top institutes in the world in this field. Cooperation with NCSU is thus of crucial importance to the Action.

STSMs have been one of the most important activities in the Action. Thus, 26 of them have been accomplished or accepted to start. This has strengthened cooperation between the research institutes, and also provided a means to involve young scientists. The outcome of several of the STSMs have been presented later in the workshops as oral or poster presentations, which has provided young scientists a valuable channel to practice scientific presentations.

The originally planned time-table for the Action has been followed, with two main meetings per year. The size and type of the meetings has been decided by the MC according to the allocated budget.

The presentations in the workshops as well as abstract books are available on the web site as pdf files.

## **II.B. Dissemination of results**

- *Action related Publications and Reports (list)*

- Abstract books of the workshops
- E41 workshops and conferences, presentations

### Year 2004

1. Dimitris Argyropoulos: Significance of lignin research to pulp and paper industry
2. Mario Fasching: Analytical challenges in cellulose-based industry
3. Bjarne Holmbom: Wood components into commercial products
4. Cherrylee Garcia-Lindgren: Industrial needs for wood chemical analysis

### Year 2005

5. Pedro Fardim: New Insights in Surface Science for Pulp and Paper The Contribution of Chemical Microscopy
6. Cornelia Vasile: Spectroscopical characterization of aged wood using SAXS: WAXS and FT-IR
7. Sören Barsberg: Lignin analysis by Raman- or Fluorescence spectroscopy
8. Tapani Vuorinen: Studies on unsaturated structures in lignin: extractives and polysaccharides by UV resonance Raman spectroscopy
9. Steffen Fischer: Applications of FT Raman Spectroscopy for characterization of cellulose and cellulosic materials
10. Matija Strlic: The potential of chemiluminometry in studies of lignocellulosic materials
11. Dimitrios Koullas: Fluorescence spectroscopy for the characterisation of lignocellulosics – An overview of recent research
12. Denilsson da Silva Perez: Potentialities and Limits of Using Near Infrared Spectroscopy (NIRS) to Predict Wood: Pulp and Paper Properties
13. Richard Gosselink: FT-IR characterisation of lignins with help of PCA
14. Francisco Amado: Electrospray ionization mass spectrometry as a tool for the lignin characterization
15. Anna Jacobs: MALDI-TOF mass spectrometry as a tool for hemicellulose characterization
16. Ilkka Kilpeläinen: Structural analysis of lignin by multidimensional NMR
17. Teris van Beek: LC-NMR an overview of possibilities and recent developments

18. Andreas Ebert: NMR spectroscopy of cellulose and cellulose derivatives in the solid state and in solution
19. Sirkka-Liisa Maunu: Advanced Solid State NMR Techniques in the Study of Wood and Pulp
20. Stephanie Baumberger, Mario Fasching, Göran Gellerstedt, Richard Gosselink, Bo Hortling, Jiebing Li, Bodo Saake: Molecular weight determination of lignins by size exclusion chromatography: towards a standardized method?
21. Anna Jacobs: How accurately can we determine the pulp carbohydrate composition? Comparison of results and reproducibility of different methods for carbohydrate analysis
22. Tatjana Bikova, G. Rossinska, Jevgenija Ponomarenko, G. Telysheva: Multi-wave UV/VIS-SEC as an analytical tool for characterization of lignin chemical heterogeneity over MMD
23. Göran Gellerstedt: Structural analysis of lignin using a combination of thioacidolysis and size exclusion chromatography
24. Cornelia Vasile, Carmen-Mihaela Popescu, Galina Dobeles: Pyrolysis - GC of aged wood
25. Jose del Río, Ana Gutiérrez, Angel Martínez: Analysis of native acetylated lignin monomers in lignocellulosic materials by Pyrolysis-Gas Chromatography-Mass Spectrometry
26. Elisabeth Sjöholm: Capillary electrophoresis in pulp and paper chemistry
27. Antje Potthast: SEC of cellulose including carbonyl and carboxyl group determination
28. Christiane Laine: Structural analysis of carbohydrates derived from kraft pulp samples using methylation analysis
29. Janja Zule, Vesna Tisler: Characterisation of volatile compounds in the cones, needles and twigs of European larch

## **Year 2006**

30. Frederique Bertaud, Round-robin study of COST Action E41 – WG 3 'Extractives'
31. Hannu Pakkanen, Integration of analytical methods for wood and pulping chemistry – COST E41
32. Stefan Willför, Summary of results of WG 3 on the joint analysis effort of eucalypt and spruce samples
33. Sirkka-Liisa Maunu, Integration of analytical methods for wood and pulping chemistry COST E41 / WG2 (polysaccharides)
34. Cornelia Vasile, Spectral and Thermal Characterization of the Integrated samples (COST E41 samples)
35. Arnis Treimanis, Hydromechanical Peeling of Fibre Wall Surface Layers
36. Clemence Altaner, Supra-molecular structure of Hydro-mechanically Peeled Eucalyptus Pulp Cell Wall Fractions
37. Stefan Willför, Analysis of carbohydrates comprising hemicelluloses and pectins in COST E41 spruce and eucalypt samples
38. Jürgen Puls, Summary of WG2 results
39. Dimitris Argyropoulo, Yields, Functional Groups & Molecular Weights for COST E41 Lignins

40. Tarja Tamminen, Integrated samples analysis / KCL results
41. Dimitris Argyropoulos, Toward the Forest Biorefinery with New Chemistry & New Tools
42. Alfred Abaecherli, Development of a standard analytical cluster for lignin characteristics and possible application to the E41 integrated sample analysis.
43. Stephanie Baumberger, Integration of analytical methods in WG1, Lignin
44. Claudia Crestini, NMR aided lignin characterization
45. Gerald Koch, Application of scanning UV microspectrophotometry for the topochemical detection of lignin in individual cell wall layers of pulped eucalyptus fiber
46. Ed de Jong, Compositional characterisation of wood and pulps: Summary WG1
47. Stefan Willför, Integration of analytical methods for wood and pulp – The joint analysis effort on eucalypt and spruce samples
48. Dimitris Argyropoulos, Different wood species offer different yields, lignin structures & molecular weights when isolated with the same method
49. Janis Gravitis, Steam explosion as a pretreatment method
50. Marianne Björklund Jansson, Methods for extraction of pulp and wood samples
51. Alfred Abaecherli, Analytical cluster for lignin characterisation, progress towards standardisation” (Swiss E41 complementary action)
52. Bert Volkert, New results of porosimetry measurements
53. Kristin Syverud The solute exclusion method
54. Jose del Rio, Lignin in *Eucalyptus globulus* wood and kraft pulp
55. Taina Ohra-aho, Characterisation of lignin in spruce TMP Eucalyptus chips and kraft pulp by analytical Pyrolysis-GC/MS
56. Ildiko Tanczos, Derivatization of *Eucalyptus globulus* chips and the first steps to the THM Py-GC/MS analysis of xylan extracted from it
57. Simona Peterlin, Fibre surface activity analysed by the method of selective staining and inverse gas chromatography
58. Mohammedné Ziegler, Reactivity of *Eucalyptus globulus* wood in acylation and silylation reactions studied by different surface analytical methods
59. Teris van Beek, Chemical investigation of non-polar spruce constituents
60. Ed de Jong, Summary of results of WG 1 on the joint analysis effort of eucalypt and spruce samples
61. Bodo Saake (Jürgen Puls), Summary of results of WG 2 on the joint analysis effort of eucalypt and spruce samples
62. Stefan Willför, Summary of results of WG 3 on the joint analysis effort of eucalypt and spruce samples

## **Year 2007**

63. Pedro Fardim: Chemical microscopy of fibre surfaces: new insights on fibre modification during pulping, bleaching and refining.
64. Arnis Treimanis: The advantages and drawbacks of the hydromechanical peeling method applied as a tool for fibre wall surface layers investigation.

65. Maija Mattinen: Enzymes acting on fibre surfaces – analytical challenges.
66. Alexandrs Volperts: Characterization of surface of lignin-based hybrid materials using adsorption methods, Raman microscopy and EPR.
67. Stefan Willför: Analysis of extractives in different pulps – Method development, evaluation, and recommendations.
68. Ed de Jong, Jürgen Puls, Stefan Willför: Update Joint Analysis Effort WG1, 2 and 3.
69. Lari Vähäsalo: DepoSense, real-time acoustic deposition monitoring
70. J.C. del Río, M. Hernando, J. Romero and A. Gutiérrez: A comprehensive study of different types of speck impurities present in bleached pulps using Py-GC/MS
71. Marianne Björklund Jansson: Simulations of precipitation of calcium soaps in pulp washing
72. A. Gutiérrez, J. Rencoret, S. Molina, D. Ibarra, A.T. Martínez and J.C. del Río: Gas Chromatography/Mass Spectrometry Study of Enzymatic Removal of Lipophilic Extractives Forming Pitch Deposits in Different Pulping Processes
73. Frédérique Bertaud, Eric Fourest, Matthieu Schelcher: Development of an analytical procedure for the characterisation of recalcitrant substance responsible of residual COD in pulp and paper effluent
74. Heli Sirén, Raimo Kokkonen, Stella Rovio, Seppo Kauliomäki, Teemu Työppönen: Characterization of pulp and paper waters with on-line coupled capillary electrophoresis systems
75. Teris van Beek: DESI-MS of surfaces: mass spectrometry or mass microscopy?
76. Denilson da Silva Perez: On-line measurement of pulp and fibre quality: sampling and analytical devices
77. D. Ibarra, J. Rencoret, M.I. Chávez, J.C. del Río, A. Gutiérrez, J. Romero, S. Camarero, M.J. Martínez, J. Jiménez-Barbero, A.T. Martínez: Eucalypt pulp lignin modification in an industrial-type TCF sequence including a laccase-mediator stage for improved delignification
78. Antje Potthast: Molecular weight distribution of cellulose – results of a recent Round Robin

## Posters

1. Levente Csoka, Lignin, isolated from ultrasound treated wheat straw pulp
2. Maria-Cristina Popescu, Spectral Characterization of COST E41 Spruce TMP sample
3. Clemens Altaner, Evaluation of MOPS solid-state NMR experiments by 2-D correlation plots
4. Janja Zule, Characterization of extractive compounds in branches, bark and stemwood of European larch
5. Elisabeth Windeisen, GC/MS and TLC for analysing wood extractives of eucalypt obtained by means of different extraction solvents



6. Richard Gosselink, Analysis of isolated lignin samples using organic and alkaline SEC and MALDI
7. Ilkka Kilpeläinen, Analysis of lignin with multidimensional NMR
8. Claudia Crestini, Characterisation of lignin by different spectroscopic and chromatographic techniques
9. Stephanie Baumberger, Chemical investigation of lignin using thioacidolysis
10. Jorge Rencoret, Lipids in *Eucalyptus globulus* wood and kraft pulp

### Year 2007

11. *Bertaud*, Interest of recovering wood-wastes from pulp mills for the extraction of high valuable bio-active wood extractives
12. *Billes*, Application of quantum chemical modelling for the elucidation of the role of the functional groups in wood protecting materials
13. *Caron*, Analysis of wood extracts: a holistic approach by functional group analysis via FTIR spectroscopy
14. *Curling*, Characterisation of gel properties of hemicellulose derived from timber
15. *del Rio*, Fractionation of lipophilic extractives by Solid-phase extraction: separation into functional groups
16. *Duarte*, Structural characterisation of lignins from *Pinus pinaster* kraft pulp by analytical pyrolysis
17. *Figueiredo*, Catalytic oxidation, using TEMPO, of *Eucalyptus globulus* Kraft pulp
18. *Hill*, The Forest-based Biorefinery
19. *Jacobs*, Determination of carboxyl groups in hemicelluloses
20. *Janzon*, Characterisation of nitren extracted pulps regarding their molar mass, carbonyl and carboxyl group distribution
21. *Modugno*, Characterisation of waterlogged archaeological wood by analytical pyrolysis
22. *Mortha*, Comparison of phenolic group analysis of lignins by different methods including NMR
23. *Pascu*, Surface properties of some natural polymer containing blends
24. *Peterlin*, Additional study of delignified spruce thermo-mechanical pulp samples
25. *Popescu*, Structural and morphological characterization of Norway spruce
26. *Van Beek*, Detailed analysis of lipophilic Spruce extractives by LCxLC/UV/ELSD/APCI-MS
27. *Saranpää*, Cell wall chemistry and knotwood structure of Norway spruce (*Picea abies* [L.] Karst) studied by confocal Raman microscopy
28. *Vasile*, Thermal decomposition of the integrated samples (COST E41 samples)
29. Heli Kangas, Atte Mikkelsen and Piia Honkonen, Optimized chromatographic method for eucalyptus extractives
30. Annabelle Caron, Measuring compression wood severity by scanning IR spectroscopy
31. Cornelia Vasile and Georgeta Cazacu, Measurement techniques used in the Romanian industry
32. Georgeta Cazacu, Irina Raschip and Cornelia Vasile, Characterization of the microcrystalline cellulose powder

33. Frédérique Bertaud, Matthieu Schelcher, Eric Fourest, Characterisation of Recalcitrant Substances Responsible for Residual COD in Effluents
34. Eija Bergelin, Analytical problem solving of deposits in pulp and paper manufacturing

**Other conference presentations or articles (published, submitted or under preparation)**

Simona Peterlin, Tjaša Drnovšek, Darko Dolenc, Anton Perdih, Paulo Ferreira, Isabel Moutinho, Fiber surface activity analyzed by the method of selective staining and inverse gas chromatography, 9th European workshop on lignocellulosics and pulp, Aug 27-30, 2006, Vienna, Austria

Thomas Ters, Michael Grabner, Stefan Willför, Barbara Hinterstoisser, Pinus sylvestris and pinus nigra – differences in extractives content and composition, 9th European workshop on lignocellulosics and pulp, Aug 27-30, 2006, Vienna, Austria

C-M Popescu, G. Dobeles, G. Telysheva, C. Vasile, Degradation of lime wood painting supports. III Evaluation of changes in the structure of aged lime wood by different physico-chemical methods, , 17-th International Symposium on Analytical and Applied Pyrolysis May 21-26, 2006, send for publication to J. Anal. Appl. Pyrolysis

Carmen-Mihaela Popescu, Maria-Cristina Popescu, Gh. Singurel, Cornelia Vasile, Dimitris S. Argyropoulos, Stefan Willför, Spectral characterization of Eucalyptus Wood, 7-th INTERNATIONAL BALKAN WORKSHOP on APPLIED PHYSICS July 5-7th, 2006, send for publication to J. of Optoelectronic and Advanced Materials

M. P. Colombini, M. Orlandi, F. Modugno, E-L. Tolppa, M. Sardelli, L. Zoia, C. Crestini, Archaeological Wood Characterisation By Py/Gc/Ms, Gc/Ms, Nmr And Gpc Techniques, Microch. J. ( 2006 ) in press, available on line, from 27 June 2006

Stefan Willför, Jarl Hemming, Ann-Sofie Leppänen, Analysis of extractives in different pulps – Method development, evaluation, and recommendations Åbo Akademi Report B1-2006.

I.C.A. Sandu, M. Brebu, C. Luca, I. Sandu and C. Vasile, Thermogravimetric study on the ageing of lime wood supports of old paintings, Polym. Degrad. Stab., 80, 83-91 (2003).

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C-M Popescu, G. Dobeles, G. Telysheva, C. Vasile, Degradation of lime wood painting supports. III Evaluation of changes in the structure of aged lime wood by different physico-chemical methods, 17-th International, Symposium on Analytical and Applied Pyrolysis May 21-26, 2006.

C.-M. Popescu, G. Dobeles, G. Telysheva, C. Vasile, Degradation of lime wood painting supports. III Evaluation of changes in the structure of aged lime wood by different physico-chemical methods, , J. Anal. Appl. Pyrolysis **79**, 71-77, 2007

C. Vasile, R. Gosselink, P. Quintus, E.G. Koukios, D. P. Koullas, E. Avgerinos, A. Abacherli, Analytical methods for lignin characterization. I. Thermogravimetry; *Cell. Chem. Technol* – **40** (9-10) 421 (2006), published 2007

C.-M. Popescu, C. Vasile, M.-C. Popescu, Gh. Singurel, B. S. Munteanu, V.I. Popa, Analytical methods for lignin characterisation II) Spectroscopical studies, *Cell. Chem. Technol.* **40** (9-10) 597 (2006) published 2007

Carmen-Mihaela Popescu, Maria-Cristina Popescu, Gh. Singurel, Cornelia Vasile, Dimitris S. Argyropoulos, Stefan Willfor, Spectral characterization of Eucalyptus Wood, 7-th INTERNATIONAL BALKAN WORKSHOP on APPLIED PHYSICS July 5-7th, 2006

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C. Vasile, B.S. Munteanu, M.C. Popescu, C.M. Popescu, Structural differences between lignin from woody plants and from annually fibre crops evidenced by spectroscopical and thermal methods, The 7-th ILI Forum Barcelona 27 – 28 April 2005: Bringing lignin back to the headlines priority research and new approaches Domain 2 poster 7, Proceedings p. 133-136

Ildiko Mohammed-Ziegler, Ildiko Tanczos, Zoltan Horvolgyi, Bianka Agoston, Water-repellent acylated and silylated wood samples and their surface analytical characterization, *Colloids Surf. A: Physicochem. Eng. Aspects* (2007), doi:10.1016/j.colsurfa.2007.06.063.

- *Conferences and Workshops (list and programme)*

Conferences and workshops have been arranged as follows.

21-22.10.2004, Espoo, Finland  
24.-26.4.2005, Barcelona, Spain  
7.-8.11.2005, Stockholm, Sweden  
12.-13.4.2006, Grenoble, France  
31.8.-1.9.2006, Vienna, Austria  
7.-8.5.2007, Rome, Italy  
22.-23.11.2007, Bled, Slovenia

Programmes:

## Espoo, Finland: Open Workshop October 2004

**Time:** Thursday, 21<sup>th</sup> of October 2004

**Place:** Dipoli congress centre, room 4, Espoo, Otaniemi

### 9.30 – 10.00 Registration and coffee

#### I. Program

10.00	Wellcome and introduction to E41	Tarja Tamminen
Plenary lectures, chair: Gerard Mortha		
10.15	Significance of lignin research to pulp and paper industry	Dimitris Argyropoulos, guest speaker, North Carolina State University, USA
10.45	Analytical challenges in cellulose-based industry	Mario Fasching, Lenzing
11.15	Wood components into commercial products	Bjarne Holmbom, Åbo Akademi, Finland
11.45	Industrial needs for wood chemical analysis	Cherrylee Garcia-Lindgren, M-Real, Sweden
12.15 – 13.30 Lunch		
Short presentations of national research activities, chair: Stefan Willför		
13.30	Austria Denmark France Germany Italy Latvia Netherlands Norway	Ildiko Tanczos Søren Barsberg Gerard Mortha Jürgen Puls Marco Orlandi Arnis Treimanis Ed de Jong Kristin Syverud
15.00 – 15.30 Coffee break		
Short presentations of national research activities continues, chair: Ed de Jong		
15.30	Finland Portugal Romania Slovenia Spain Sweden Switzerland NCSU, USA	Tapani Vuorinen Dimitry Evtuguin Leliora Iancu Matija Strlic Angel Martinez Elisabeth Sjöholm Alfred Abaecherli Dimitris Argyropoulos
17.00-18.00	Discussion on national activities, initializer: Jürgen Puls	
Evening at KCL		
19.30	What is KCL, cocktails at posters	
20.00	Dinner	

**Friday, 22<sup>nd</sup> of October 2004**

A. Parallel WG meetings

Place: Dipoli congress centre

WG1: room 4B

WG2: room 4A

WG3: room 25

Program:

9.00 Presentation of the activities of the WG members

- currently used analytical methods
- available instruments
- existing co-operation and networks
- identified lack of analytical tools

*10.30 – 11.00 Coffee break*

11.00 Presentation of the activities of the WG member continues

*12.30 – 14.00 Lunch*

B. Joint meeting (all WGs and MC)

Place: Dipoli congress centre, room 4B

14.00 Summaries of the morning meetings (WG leaders)

14.45 Scientific focuses of future meetings

*15.30 – 16.00 Coffee break*

**Management Committee Meeting**

part one: Thursday, 21<sup>th</sup> of October 2004, 8.30 to 9.30

part two: Friday, 22<sup>th</sup> of October 2004, 16.00 to 17.30

Place: Dipoli congress centre, room 4, Espoo, Otaniemi

Time:

Barcelona, Spain Workshop 24-25 April 2005

## Spectrometric techniques used for the analysis of Carbohydrates, Lignin and Extractives

Final Programme:

Sunday 24 of April

16.00 - 19.00 Steering Committee Meeting

19.30 – 20.30 Management Meeting

1. Welcome to participants
2. Adoption of agenda
3. Minutes of last meeting
4. Year Budget planning
5. STSM status, applications
6. Scientific programme of next meeting (Stockholm, Sweden) on chromatography

Monday 25 of April

9.00 - 9.30 Welcome and reimbursement procedure

9.30 - 10.00 Pedro Fardim (Finland): "New Insights in Surface Science for Pulp and Paper: The Contribution of Chemical Microscopy"

10.00 - 10.30 Cornelia Vasile (Romania): "Spectroscopical characterization of aged wood using SAXS, WAXS and FT-IR"

10.30 - 11.00 Sören Barsberg (Denmark) "Lignin analysis by Raman- or Fluorescence spectroscopy"

11.00 - 11.30 Coffee

11.30 - 12.00 Tapani Vuorinen (Finland): "Studies on unsaturated structures in lignin, extractives and polysaccharides by UV resonance Raman spectroscopy"

12.00 - 12.30 Steffen Fischer (Germany): "Applications of FT Raman Spectroscopy for characterization of cellulose and cellulosic materials"

12.30 - 13.00 Matija Strlic (Slovenia): "The potential of chemiluminometry in studies of lignocellulosic materials"

13.00 - 14.00 Lunch

14.00 - 14.30 Dimitrios Koullas (Greece): "Fluorescence spectroscopy for the characterisation of lignocellulosics – An overview of recent research"

14.30 - 15.00 Denilsson da Silva Perez (France) Potentialities and Limits of Using Near Infrared Spectroscopy (NIRS) to Predict Wood, Pulp and Paper Properties

15.00 - 15.30 Tea/coffee

15.30 - 16.00 Richard Gosselink (Netherlands): FT-IR characterisation of lignins with help of PCA

16.00 - 16.30 Francisco Amado (Portugal): "Electrospray ionization mass spectrometry as a tool

for the lignin characterization”

16.30 - 17.00 Anna Jacobs (Sweden): "MALDI-TOF mass spectrometry as a tool for hemicellulose characterization"

20.30 Diner

Tuesday 26 of April

9.00 - 10.30 Integrating analytical techniques on specified samples (Jürgen Puls Chairman)

10.30 - 12.00 Coffee (Separate Working Group Meetings) Identifying / subdividing techniques over laboratories within the 3 WG

12.00 - 12.30 Ilkka Kilpeläinen (Finland): "Structural analysis of lignin by multidimensional NMR"

12.30 - 13.00 Teris van Beek (Netherlands): "LC-NMR: an overview of possibilities and recent developments"

13.00 - 14.00 Lunch

14.00 - 14.30 Andreas Ebert (Germany): "NMR spectroscopy of cellulose and cellulose derivatives in the solid state and in solution"

14.30 - 15.00 Sirkka Liisa Maunu (Finland): "Advanced Solid State NMR Techniques in the Study of Wood and Pulp"

## Stockholm, Sweden, Workshop November 2005

### Chromatography in Pulping and Papermaking Tuesday 8<sup>th</sup> of November, STFI-Packforsk, Stockholm, Sweden

*8.30 – 9.00 Coffee/tea, welcoming words*

9.00 – 9.30 S. Baumberger, M. Fasching, G. Gellerstedt, R. Gosselink, B. Hortling, J. Li, B. Saake: Molecular weight determination of lignins by size exclusion chromatography: towards a standardized method?

9.30 – 10.00 A. Jacobs: How accurately can we determine the pulp carbohydrate composition? Comparison of results and reproducibility of different methods for carbohydrate analysis

10.00 – 10.30 T. Bikova, G. Rossinska, J. Ponomarenko, G. Telysheva: Multi-wave UV/VIS-SEC as an analytical tool for characterization of lignin chemical heterogeneity over MMD

*10.30 – 11.00 Coffee/tea*

11.00 – 11.30 G. Gellerstedt: Structural analysis of lignin using a combination of thioacidolysis and size exclusion chromatography

11.30 – 12.00 C. Vasile, M. Popescu, G. Dobeles: Pyrolysis - GC of aged wood

12.00 – 12.30 J. del Río, A. Gutiérrez, A. Martínez: Analysis of native acetylated lignin monomers in lignocellulosic materials by Pyrolysis-Gas Chromatography-Mass Spectrometry

*12.30 – 14.00 Lunch*

14.00 – 14.30 E. Sjöholm: Capillary electrophoresis in pulp and paper chemistry

14.30 – 15.00 A. Potthast: SEC of cellulose including carbonyl and carboxyl group determination

*15.00 – 15.30 Tea/coffee*

15.30 – 16.00 C. Laine: Structural analysis of carbohydrates derived from kraft pulp samples using methylation analysis

16.00 – 16.30 J. Zule, V. Tisler: Characterisation of volatile compounds in the cones, needles and twigs of European larch



## Grenoble, France, Workshop April 2006

### Progress of the “COST E41 Joint Analysis Effort” on wood and fiber characterisation, Grenoble 12-13 April 2006

#### Wednesday 12th of April

Welcome and reimbursement procedure

- |                       |   |
|-----------------------|---|
| Frederique Bertaud    | Round-robin study of COST Action E41 – WG 3 ‘Extractives’   |
| Hannu Pakkanen        | Integration of analytical methods for wood and pulping chemistry – COST E41                             |
| Stefan Willför        | Summary of results of WG 3 on the joint analysis effort of eucalypt and spruce samples                  |
| Sirkka-Liisa Maunu    | Integration of analytical methods for wood and pulping chemistry COST E41 / WG2 (polysaccharides)       |
| Cornelia Vasile       | Spectral and Thermal Characterization of the Intergrated samples (COST E41 samples)                     |
| Arnis Treimanis       | Hydromechanical Peeling of Fibre Wall Surface Layers  |
| Clemence Altaner      | Supra-molecular structure of Hydro-mechanically Peeled Eucalyptus Pulp Cell Wall Fractions              |
| Stefan Willför        | Analysis of carbohydrates comprising hemicelluloses and pectins in COST E41 spruce and eucalypt samples |
| Jürgen Puls           | Summary of WG2 results  |
| Dimitris Argyropoulos | Yields, Functional Groups & Molecular Weights for COST E41 Lignins                                      |
| Tarja Tamminen        | Integrated samples analysis / KCL results   |
| Dimitris Argyropoulos | Toward the Forest Biorefinery with New Chemistry & New Tools  |

Roundtrip at CTP/EFPG

#### Thursday 13th of April

- |                   |   |
|-------------------|---|
| Alfred Abaecherli | Development of a standard analytical cluster for lignin characteristics and possible application to the E41 integrated sample analysis. |
|-------------------|---|

Stephanie Baumberger Integration of analytical methods in WG1, Lignin

Claudia Crestini NMR aided lignin characterization

Gerald Koch Application of scanning UV microspectrophotometry for the topochemical detection of lignin in individual cell wall layers of pulped eucalyptus fiber

Ed de Jong Compositional characterisation of wood and pulps: Summary WG1

Discussion and future plans

## **Vienna, Austria, Workshop Aug-Sept 2006**

### **Sample preparation and presentations from the “COST E41 Joint Analysis Effort on wood and fibre characterisation”**

#### **Vienna, 31<sup>st</sup> August – 1<sup>st</sup> September 2006**

##### **Thursday 31<sup>st</sup> August**

- 9.00 – 9.30 Coffee, welcome and reimbursement procedure
- 9.30 – 9.45 Tarja Tamminen “Overview on COST E41 and the activities”
- 9.45 – 10.00 Stefan Willför “Integration of analytical methods for wood and pulp – The joint analysis effort on eucalypt and spruce samples”
- 10.00 – 10.30 Dimitris Argyropoulos “Different wood species offer different yields, lignin structures & molecular weights when isolated with the same method”

##### **10.30 – 11.00 Coffee/tea**

- 11.00 – 11.30 Janis Gravitis “Steam explosion as a pretreatment method”
- 11.30 – 12.00 Marianne Björklund Jansson “Methods for extraction of pulp and wood samples”
- 12.00 – 12.20 Alfred Abächerli “Analytical cluster for lignin characterisation, progress towards standardisation” (Swiss E41 complementary action)
- 12.20 – 13.00 Short (2-3 slides, 2-3 minutes per speaker) introduction to posters

##### **13.00 – 14.00 Lunch**

14.00 – 15.00 Poster session

1. Levente Csoka “Lignin, isolated from ultrasound treated wheat straw pulp”
2. Maria-Cristina Popescu “Spectral Characterization of COST E41 Spruce TMP sample”
3. Clemens Altaner “Evaluation of MOPS solid-state NMR experiments by 2-D correlation plots”
4. Janja Zule “Characterization of extractive compounds in branches, bark and stemwood of European larch”
5. Elisabeth Windeisen “GC/MS and TLC for analysing wood extractives of eucalypt obtained by means of different extraction solvents”
6. Richard Gosselink “Analysis of isolated lignin samples using organic and alkaline SEC and MALDI”
7. Ilkka Kilpeläinen “Analysis of lignin with multidimensional NMR”
8. Claudia Crestini “Characterisation of lignin by different spectroscopic and chromatographic techniques”
9. Stephanie Baumberger “Chemical investigation of lignin using thioacidolysis”
10. Jorge Rencoret “Lipids in *Eucalyptus globulus* wood and kraft pulp”

15.00 – 17.00 **Management committee meeting (+coffee/tea)**

20:00 – 23:00 **Dinner**

## Functional Groups and Surface Analysis of Wood and Fibres. - Organised by COST E41, Rome 7-8 May 2007

### Monday 7 of May

8.45 – 9.00 Tarja Tamminen: Welcome and reimbursement procedure

Session Chairman: Cherryleen Garcia-Lindgren

9.00 – 9.30 Pedro Fardim: Chemical microscopy of fibre surfaces: new insights on fibre modification during pulping, bleaching and refining.

9.30 – 10.00 Arnis Treimanis: The advantages and drawbacks of the hydromechanical peeling method applied as a tool for fibre wall surface layers investigation.

10.00 – 10.30 Maija Mattinen: Enzymes acting on fibre surfaces – analytical challenges.

10.30 – 11.00 Alexandrs Volperts: Characterization of surface of lignin-based hybrid materials using adsorption methods, Raman microscopy and EPR.

### 11.00 – 11.30 Coffee/tea

Session Chairman: Antje Potthast

11.30 – 12.00 Stefan Willför: Analysis of extractives in different pulps – Method development, evaluation, and recommendations.

12.00 – 12.15 Ed de Jong, Jürgen Puls, Stefan Willför: Update Joint Analysis Effort WG1, 2 and 3.

12.15 – 13.00 Short (2-3 slides, 2-3 minutes per speaker) introduction to posters

### 13.00 – 14.30 Lunch

14.30 – 15.30 Poster session

*Bertaud:* Interest of recovering wood-wastes from pulp mills for the extraction of high valuable bio-active wood extractives

*Billes:* Application of quantum chemical modelling for the elucidation of the role of the functional groups in wood protecting materials

*Caron:* Analysis of wood extracts: a holistic approach by functional group analysis via FTIR spectroscopy

- Curling:* Characterisation of gel properties of hemicellulose derived from timber
- del Rio:* Fractionation of lipophilic extractives by Solid-phase extraction: separation into functional groups
- Duarte:* Structural characterisation of lignins from *Pinus pinaster* kraft pulp by analytical pyrolysis
- Figueiredo:* Catalytic oxidation, using TEMPO, of *Eucalyptus globulus* Kraft pulp
- Hill:* The Forest-based Biorefinery
- Jacobs:* Determination of carboxyl groups in hemicelluloses
- Janzon:* Characterisation of nitren extracted pulps regarding their molar mass, carbonyl and carboxyl group distribution
- Modugno:* Characterisation of waterlogged archaeological wood by analytical pyrolysis
- Mortha:* Comparison of phenolic group analysis of lignins by different methods including NMR
- Pascu:* Surface properties of some natural polymer containing blends
- Peterlin:* Additional study of delignified spruce thermo-mechanical pulp samples
- Popescu:* Structural and morphological characterization of Norway spruce
- Van Beek:* Detailed analysis of lipophilic Spruce extractives by LCxLC/UV/ELSD/APCI-MS
- Saranpää:* Cell wall chemistry and knotwood structure of Norway spruce (*Picea abies* [L.] Karst) studied by confocal Raman microscopy
- Vasile:* Thermal decomposition of the integrated samples (COST E41 samples)

Session chairman: Angel Martinez

- 15.30 – 16.00 Dimitry Evtuguin, Marco Orlandi, Claudia Crestini, Stephanie Baumberger, Ilkka Kilpeläinen, Dimitris Argyropoulos: An overview of the analytical tools in the quali/quantitative analysis of functional groups and interunit bondings in lignin. I. Functional groups determination
- 16.00 – 16.30 Stephanie Baumberger, Claudia Crestini, Ilkka Kilpeläinen, Marco Orlandi, Dimitry Evtuguin, Dimitris Argyropoulos: An overview of the analytical tools in the quali/quantitative analysis of functional groups and interunit bondings in lignin. II. Interunit bondings characterisation
- 16.30 – 17.00 Richard Gosselink: In-depth structural study of technical lignins.

**Evening**

**Dinner**

## **Tuesday 8<sup>th</sup> of May**

9.00 – 10.30 Management committee meeting.

### **10.30 – 11.00 Coffee/tea**

Session chairman: Marco Orlandi

11.00 – 11.30 Ute Henniges: GPC and CCOA analysis in combination with some results on carboxyl and carbonyl group determination in pulps.

11.30 – 12.00 Anni Lähdetie: Comparison of phenolic hydroxyl group determination methods.

12.00 – 12.30 Carmen-Mihaela Popescu: New method for lignins identification

### **12.30 – 14.00 Lunch**

## **Real mill problems solved by analytical techniques and methods for on-line measurements**

Joint workshop of the working groups:  
November 22<sup>th</sup> to 23<sup>th</sup>, 2007, Bled, Slovenia

### **Thursday 22.11**

*16.30 – 17.40 Registration, coffee/tea*

DITP presentation, open to COST E41 participants

17.40 – 18.00 Tarja Tamminen: COST Action E41, Analytical tools with applications for wood and pulping chemistry

18.00 – 19.00 Poster session with refreshments:

Heli Kangas, Atte Mikkelsen and Piia Honkonen:  
Optimized chromatographic method for eucalyptus extractives

Annabelle Caron:  
Measuring compression wood severity by scanning IR spectroscopy

Cornelia Vasile and Georgeta Cazacu:  
Measurement techniques used in the Romanian industry

Georgeta Cazacu, Irina Raschip and Cornelia Vasile:  
Characterization of the microcrystalline cellulose powder

Frédérique Bertaud, Matthieu Schelcher, Eric Fourest:  
Characterisation of Recalcitrant Substances Responsible for Residual COD in Effluents

Eija Bergelin:  
Analytical problem solving of deposits in pulp and paper manufacturing

**Dinner**



**Friday 23.11**

- 8.30 – 9.00 *Coffee/tea*  
*Chairperson Annabelle Caron*
- 9.00 – 9.30 Lari Vähäsalo: DepoSense, real-time acoustic deposition monitoring
- 9.30 – 10.00 J.C. del Río, M. Hernando, J. Romero and A. Gutiérrez:  
A comprehensive study of different types of speck impurities present in bleached pulps using Py-GC/MS
- 10.00 – 10.30 Marianne Björklund Jansson: Simulations of precipitation of calcium soaps in pulp washing
- 10.30 – 11.00 *Coffee/tea*  
*Chairperson Eija Bergelin*
- 11.00 – 11.30 A. Gutiérrez, J. Rencoret, S. Molina, D. Ibarra, A.T. Martínez and J.C. del Río: Gas Chromatography/Mass Spectrometry Study of Enzymatic Removal of Lipophilic Extractives Forming Pitch Deposits in Different Pulping Processes
- 11.30 – 12.00 Frédérique Bertaud, Eric Fourest, Matthieu Schelcher: Development of an analytical procedure for the characterisation of recalcitrant substance responsible of residual COD in pulp and paper effluent
- 12.00 – 12.30 Heli Sirén, Raimo Kokkonen, Stella Rovio, Seppo Kauliomäki, Teemu Työppönen: Characterization of pulp and paper waters with on-line coupled capillary electrophoresis systems
- 12.30 – 13.30 *Lunch*  
*Chairperson Ute Henniges*
- 13.30 – 14.00 Teris van Beek: DESI-MS of surfaces: mass spectrometry or mass microscopy?
- 14.00 – 14.30 Denilson da Silva Perez: On-line measurement of pulp and fibre quality: sampling and analytical devices
- 14.30 – 15.00 D. Ibarra, J. Rencoret, M.I. Chávez, J.C. del Río, A. Gutiérrez, J. Romero, S. Camarero, M.J. Martínez, J. Jiménez-Barbero, A.T. Martínez: Eucalypt pulp lignin modification in an industrial-type TCF sequence including a laccase-mediator stage for improved delignification
- 15.00 – 15.30 Antje Potthast: Molecular weight distribution of cellulose – results of a recent Round Robin

- *Web site (description)*

The main channel for the dissemination is the Action web page, <http://www.vtt.fi/proj/coste41/index.jsp>. The page contains general information about the

Action, e.g. the MoU, and contact information for the various activities (WG, STSM). The programmes and presentations in the meetings and workshops are also found.

- *Scientific and Technical Cooperation*

Many new contacts have been developed between the participating laboratories, as revealed in the survey made for the mid-term evaluation. That was rated as the most important added value created by the Action. A positive synergistic effect on the level of pulp and paper related analytical chemistry in Europe is thus expected. One demonstration of the cooperation are the STSMs. A list of them indicates the laboratories that have taken part, as well as the topics.

	Visitor	Time and allowance	Affiliated Institution / Laboratory / Supervisor	Host Laboratory / Supervisor /	Topic
<b>2004</b>					
1.	Sarah BRUNETA LISBOA  Ph.D student	16/10/2004 to 23/10/2004  870 €	University of Aveiro (Portugal) Pr. Dmitry EVTUGUIN Pr. Carlos PASCOAL NETO	ÅBO Akademi (Turku, Finland) Pr. Bjarne HOLMBOM Dr. Pedro FARDIM	Surface characterization of Eucalyptus globulus unbleached kraft pulps containing precipitated xylans
2.	Dr Carmen FREIRE BARROS	16/10/2004 to 23/10/2004  870 €	University of Aveiro (Portugal)	ÅBO Akademi (Turku, Finland) Pr. Bjarne HOLMBOM Dr. Pedro FARDIM	Surface characterization of chemically modified bleached hardwood fibres
3.	Dr Tiina LIITIA  <a href="mailto:tiina.liitia@kcl.fi">tiina.liitia@kcl.fi</a>	15/11/2004 to 26/11/2004  2280 €	KCL (Finland)	University of LJUBLJANA (Slovenia) Faculty of Chemistry and Chemical Technology, Assoc. Pr. STRLIC	Applicability of chemiluminometry for paper aging analysis measured from pulp handsheets
<b>2005</b>					
4.	Audrey BOURGEOIS  Ph.D student	16/01/2005 to 23/01/2005  1100 €	EFPG (France) Pr. Gerard MORTHA	ÅBO Akademi (Turku, Finland) Pr. Bjarne HOLMBOM Dr. Pedro FARDIM	Surface carboxyl groups determination in cellulosic pulps for transformer boards manufacturing, in relation to their metal cations surface adsorption properties
5.	Dr Drago KOCAR  drago.kocar@uni-lj.si	20/02/2005 to 05/03/2005  2000 €	University of LJUBLJANA (Slovenia) Faculty of Chemistry and Chemical Technology	STFI-Packforsk (Sweden)  Dr. Elisabeth SJÖHOLM	Measurements of molecular weight distribution of cellulose in pulp samples using SEC-MALLS and ethylisocyanate derivatisation

					technique
6.	Olena SEVASTYANOV A <a href="mailto:olena.sevast@polymer.kth.se">olena.sevast@polymer.kth.se</a>  Ph.D student	05/03/2005 to 19/03/2005  1970 €	KTH (Sweden) Pr. Göran GELLERSTEDT	University of Aveiro (Portugal) Pr. Dmitry EVTUGUIN	Analysis of water and ethanol extracts from papers using HPLC-MS techniques for understanding the mechanism of thermal yellowing of paper
7.	Ron JANZON <a href="mailto:r.janzon@holz.uni-hamburg.de">r.janzon@holz.uni-hamburg.de</a>  Ph.D student	01/04/2005 to 30/04/2005  1900 €	Federal research centre for forestry and forest products, Institute for wood chem. and chemical technol. of wood, Pr. Jürgen PULS	Univ. of Natural Resources and Applied Life Sciences (BOKU), Dept. of Chemistry Prof. Paul KOSMA	Characterisation of the molar mass distribution and a direct detection of carbonyl groups by SEC in DMAc/LiCl
8.	Carmen Mihaela POPESCU <a href="mailto:mihaela_cpop@yahoo.co.uk">mihaela_cpop@yahoo.co.uk</a>  PhD student	06/06/2005 to 17/06/2005  1110 €	Romanian Academy, "Petru Poni" – Institute of Macromolecular Chemistry, Iassy, Romania, Cornelia VASILE	LS Institute of Wood Chemistry Dr Galina TELYSHEVA	Characterization of the aging of wood by clarification of the role of wood composition and structure on the degradation behaviour
<b>2006</b>					
9.	Giuseppina IAMARINO <a href="mailto:giusiam@hotmail.com">giusiam@hotmail.com</a>  PhD student	21/01/2006 to 09/04/2006  2500 €	Dipartimento di Scienze del Suolo, della Pianta e dell'Ambiente, Università Federico II, Portici, Italy, Marco ORLANDI	Centro de Investigaciones Biológicas (CSIC), Campus de la Ciudad Universitaria, Madrid, Spain Maria Jesus MARTINEZ	Screening of lignin degrading fungi for industrial effluents, combined with characterization of the structural changes lignin
10.	Ute HENNIGES <a href="mailto:ute.henniges@boku.ac.at">ute.henniges@boku.ac.at</a>  PhD student	23/01/2006 to 05/02/2006  1900 €	University of Natural Resources and Applied Life Sciences Vienna (BOKU)	STFI-Packforsk, Sweden Dr Elisabeth SJÖHOLM	Combination of fluorescence labelling and improved cellulose solubility
11.	Dr Zoltán HÓRVÖLGYI  <a href="mailto:zhorvolgyi@mail.bme.hu">zhorvolgyi@mail.bme.hu</a>	19/03/2006 to 25/03/2006  850 €	Budapest University of Technology and Economics, Department of Physical Chemistry, Hungary	Chemical Technology of Organic Materials, Johannes Kepler University Linz, Dr Ildiko TANCZOS	Study of the surface reactivity of the integrated sample of COST E41 (Eucalyptus globulus) towards acylation and silylation by different reactants: wettability studies
12.	Dr Ildiko MOHAMMED-ZIEGLER  <a href="mailto:mohazihu@yahoo.c">mohazihu@yahoo.c</a>	19/03/2006 to 25/03/2006  850 €	Gedeon Richter Ltd., Hungary	Chemical Technology of Organic Materials, Johannes Kepler University Linz, Dr Ildiko	Study of the surface reactivity of the integrated sample of COST E41 (Eucalyptus

	om			TANCZOS	globulus) towards acylation and silylation by different reactants: chemical analyses
13.	Simona PETERLIN simona.peterlin@icp-lj.si  PhD student	19/03/2006 to 01/04/2006  2050 €	Pulp and Paper Institute, Ljubljana, Slovenia, Tjasa DRNOVSEK	University of Coimbra, Coimbra, Pr Paulo FERREIRA	Inverse Gas Chromatography analyses on two COST E41 pulp samples with comparison to a new method of selective staining for fibre surfaces.
14.	Thomas TERS thomas.ters@boku.ac.at  PhD student	01/04/2006 to 30/04/2006  2000 €	University of Natural Resources and Applied Life Sciences, Vienna, Austria	Åbo Akademi University, Turku, Finland Stefan WILLFÖR	Development of a fast determination method for pine extractives via NIR-spectroscopy
15.	Heiko WINTER h.winter@holz.uni-hamburg.de  PhD student	08/05/2006 to 02/06/2006  1500 €	Federal Research Centre for Forestry and Forest Products, Hamburg, Germany, Pr Jürgen PULS	Åbo Akademi University, Turku, Finland Stefan WILLFÖR	Comparison of different methods and detectors for extractives: GC, HPLC with UV, fluorescence or MS detection.
16.	Jorge RENCORET jrencoret@irnase.csic.es  PhD student	15/06/2006 to 18/08/2006  2500 €	Instituto de Recursos Naturales y Agrobiología de Sevilla, CSIC, Seville, Spain, Dr Jose del RIO	Royal Institute of Technology, KTH, Stockholm, Sweden, Pr Göran GELLERSTEDT	Structural characterization of milled wood lignins from softwoods, hardwoods and nonwoods, by thioacydolytic and 2D-NMR techniques.
17.	Anni LÄHDETIE (Kilpeläinen)  <a href="mailto:anni.lahdetie@tkk.fi">anni.lahdetie@tkk.fi</a> PhD student	15/11/2006 to 18/11/2006  2500 €	Helsinki University of Technology, Laboratory of Forest Products Chemistry, Espoo, Tapani VUORINEN	École Française de Papeterie et des Industries Graphiques, Saint Martin d'Hères, Gerard MORTHA	Comparison of three different methods for determining phenolic hydroxyl groups
18.	Richard GOSELINK richard.gosselink@wur.nl  PhD student	20/11/2006 to 01/12/2006  2500 €	Wageningen University and Research, Fibre and Paper Technology, The Netherlands, Dr Ed de JONG	Royal Institute of Technology, KTH, Stockholm, Sweden, Pr Göran GELLERSTEDT	Determination of lignin molar mass by SEC - MALDI-TOF/MS and structural analyses e.g. by NMR
19.	Dr Clemens ALTANER  c.altaner@chem.gla.ac.uk	22/01/2007 to 27/01/2007  730 €	University of Glasgow, GB	Abo Akademi University, Process Chemistry Centre, Turku/Åbo, Andrey PRANOVICH	Microanalysis of sequentially extracted wood
20.	Dr Anne-Laurence	19/02/2007 to	Centre de	University of Natural	Investigation into

	DUPONT aldupont@mnhn.fr	24/02/2007 950 €	recherches sur la conservation des documents graphiques, Paris, France	Resources and Applied Life Sciences, Vienna, Austria, Antje POTTHAST	tidelines in paper - SEC with carbonyl and carboxyl fluorescent labelling method
21.	Anna ANDERSONE <a href="mailto:ligno@edi.lv">ligno@edi.lv</a> PhD student	27/03/2007 to 08/04/2007 1815 €	Latvian State Institute of Wood Chemistry, Latvia Dr TELYSHEVA	University of Aveiro, Department of Chemistry, Portugal, Dmitry EVTUGUIN	Characterization of silicon-containing derivatives of lignin
22.	Maija-Liisa MATTINEN <a href="mailto:majja.mattinen@vtt.fi">majja.mattinen@vtt.fi</a>	18/03/2007 to 31/03/2007 1860 €	VTT Biotechnology, Espoo, Finland	Wageningen University and Research, Fibre and Paper Technology, The Netherlands, Ed de JONG	Evaluation of MALDI-TOF MS and SEC for lignin characterization
23.	Martin ZENKER PhD student m.zenker@holz.uni-hamburg.de	14/05/2007 to 25/05/2007 750 €	Federal Research Centre of Forestry and Forest Products, Hamburg (DE)	Åbo Akademi University, Turku, Finland Stefan WILLFÖR	Methanolysis and monomer analysis of the methylglycosides with comparison to acid hydrolysis/HPAEC.
24.	Ms Edita Jasiukaityte, PhD student <a href="mailto:edita.jasiukaityte@ki.si">edita.jasiukaityte@ki.si</a>	12/11/2007 to 30/11/2007 2010 €	National Institute of Chemistry Slovenia, Ljubljana (SI)	Claudia Crestini, Tor Vergata University, Rome (IT)	Identification and characterization of lignin liquefaction products
25.	Ms Gisela Marques, PhD student <a href="mailto:Gisela@irnase.csic.es">Gisela@irnase.csic.es</a>	17/12/2007 to 31/01/2008 2500 €	Instituto de Recursos Naturales y Agrobiologia de Sevilla, (ES)	Dmitry Evtyugin, University of Aveiro,	Isolation and structural characterization of polysaccharides of sisal
	<b>Accepted</b>				
26.	Ms ANNABELLE CARON PhD student a.caron@chem.gla.ac.uk	07/01/2008 to 01/02/2008 2325 €	University of Glasgow, Glasgow(GB)	José C. del Río, IRNAS-CSIC, Seville(ES)	The analysis of Sitka spruce extractives by gas chromatography and GC MS

- *Transfer of results*

Industry has taken actively part in the Action as MC and WG members and participating in the workshops, even as speakers. Efficient dissemination of the results to industry is ascertained to the owner / financing companies of the participating institutes *via* their existing reporting practices. In addition, the results will be published as articles and conference presentations.

General presentations of Action E41:

- Research high-lights (KCL seminar series), September 9th, 2005
- 3<sup>rd</sup> Pulp and Paper Analysis Seminar, Stockholm, April 4-5, 2005: General presentation + two scientific presentations
- Poster (general E41) at the EWLP conference in Vienna, Aug/Sept 2006
- A flyer containing E41 information has been distributed in several conferences.

Cooperation has been done between E41 (WG2) and the Nordic Standardisation Program.

One of the topics in the E41 meeting in Bled, Slovenia (Nov 2007) was "analytical methods with relevance to pulp and paper industry". This was hoped to interest industry and help identifying relevant analytical methods from the practical point of view. A special lecture was given in the DITP (Slovenian Paper Engineers Association) meeting just before the E41 Bled meeting, presenting the activities of E41.

- *Contacts in the ERA*

On the Action level, good contacts have been developed with other similar activities in Europe, such as the Euro lignin Concerted Action, the European Polysaccharide Network of Excellence, both being parts of EU FP6. Several project applications are being prepared to the EU FP7 in part promoted by the Action.

The Action is related to the following other COST Actions:

- Action E50: Cell wall macromolecules and reaction wood (CEMARE)
- Action E54: Characterisation of the fine structure and properties of papermaking fibres using new technologies
- Action D29/0008/03: Production and Functionalization of Hemicelluloses for Sustainable Advanced Products
- Action FP0602: Biotechnology for lignocellulose biorefineries (BIOBIO)
- Swiss E41 complementary Action: Analytical cluster for lignin characterisation, progress towards standardisation

### **II.C. Self evaluation**

STSMs have been regarded to be an instrument which is particularly suitable for this type of an action. Thus, not only a large number of them has been accomplished, but also the outcome has in most cases been excellent, serving as a basis of future collaboration.

The joint analysis effort is regarded to be an important activity, greatly increasing the relevance of the method evaluation task, which is the main objective of the Action. It also helps to prepare joint publications, as all partners have used the same research material.

The division of the Action into three WGs based on fiber components (lignin, polysaccharides, extractives) has been slightly problematic, as many of the participants are interested in several components, or analysis of fiber composition or e.g. surface properties, which are hard to identify into a single WG. The solution has been to avoid parallel WG meetings and increase communications between the WGs.