

# Multicomponents adsorption of modified cellulose microfibrils

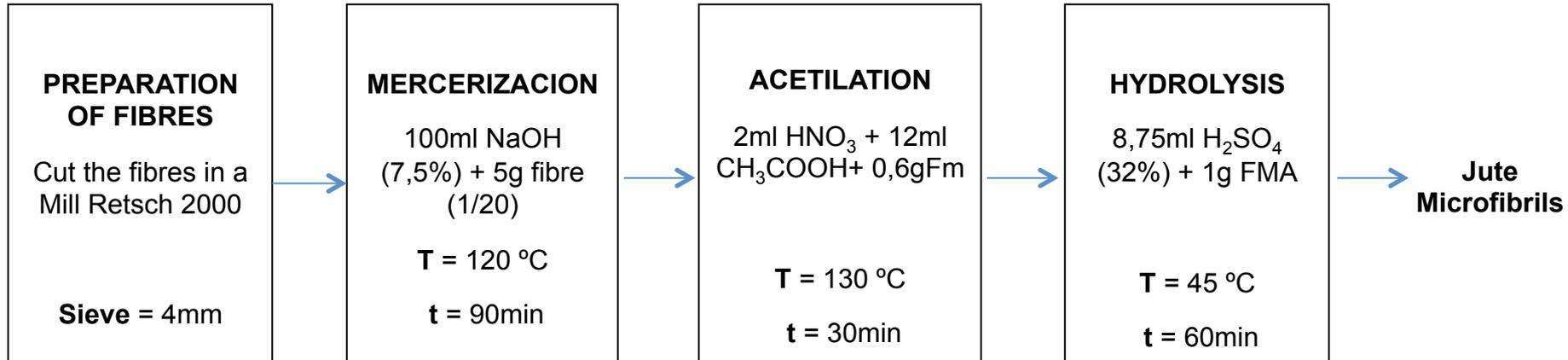
***Iñaki Urruzola,  
L. Serrano, E. Robles, R. Llano-Ponte, J.Labidi***

**Biorefinery Processes Group  
Department of Chemical and Environmental Engineering. University of the Basque  
Country, Pza. Europa 1, 20018 San  
Sebastian, Spain  
jalel.labidi@ehu.es**

# Objectives

- Elaboration of jute microfibrils with chemical treatments
- Modification of jute microfibrils to increase the adsorption capacity of these microfibrils
- Study of the adsorption capacity of the modified jute microfibrils in a multicomponent solution

# Methodology



# Functionalization of jute microfibrils

## Esterification of the fibres

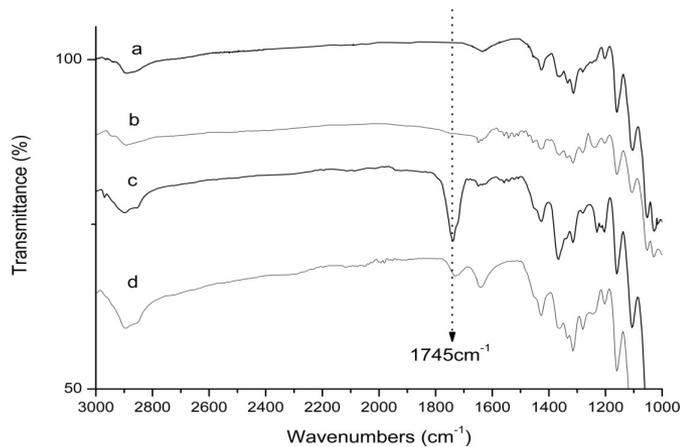
- Elimination of water by azeotropic distillation
- Addition of palmitic acid, a dehydration agent N-N' Dicyclohexylcarbodiimide (DCC), and the catalyst (DMAP)
- Putting all in a toluene/DMF (60/40) mixing to 80°C for 3h with reflux

# Results

## Composition of the jute fibre and the jute microfibrils (TAPPI)

Composition (%)	Fat and wax	Pectin	Lignin	Hemicelluloses	Cellulose
<b>Jute fibre</b>	8.3±0.12	5.4±0.77	17.2±0.98	33.5±0.55	46.2±0.73
<b>Jute Microfibrils</b>	2.9±0.11	3.4±0.81	1.7±0.23	33.1±0.02	61.7±0.14

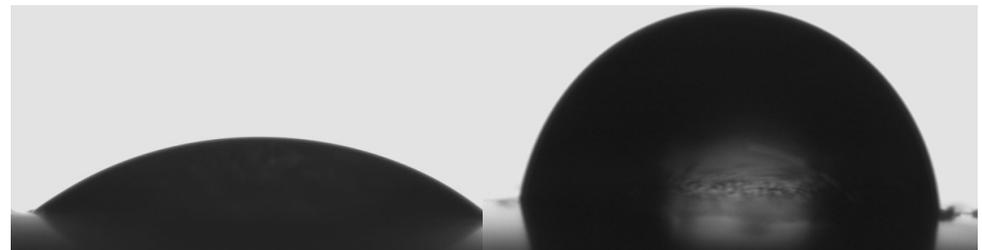
## Infrared spectroscopy



FTIR spectra of (a) Avicel, (b) M<sub>f</sub>, (c) Modified Avicel and (d) Modified M<sub>f</sub>

## Contact angle measurements

	Avicel	Modified Avicel	Microfibrils	Modified Microfibrils
<b>θ</b>	34.17±2.74	82.06±2.79	57.44±1.15	76.31±1.33

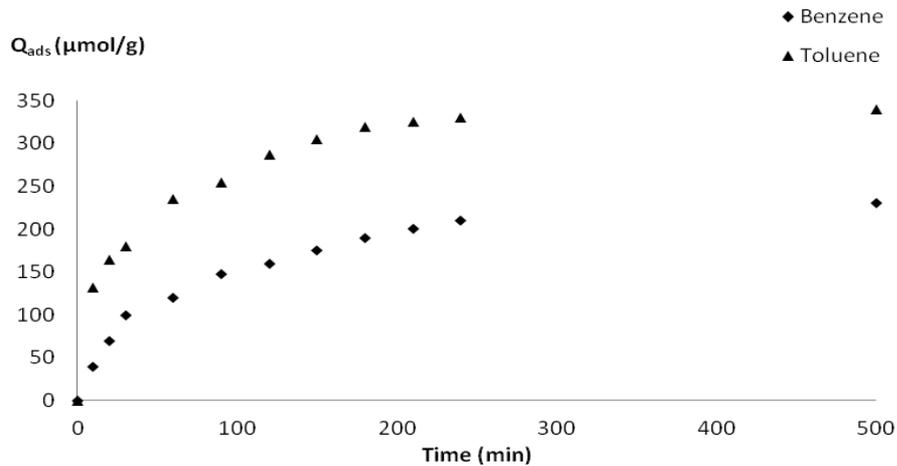


a) Microfibrils b) Modified Microfibrils

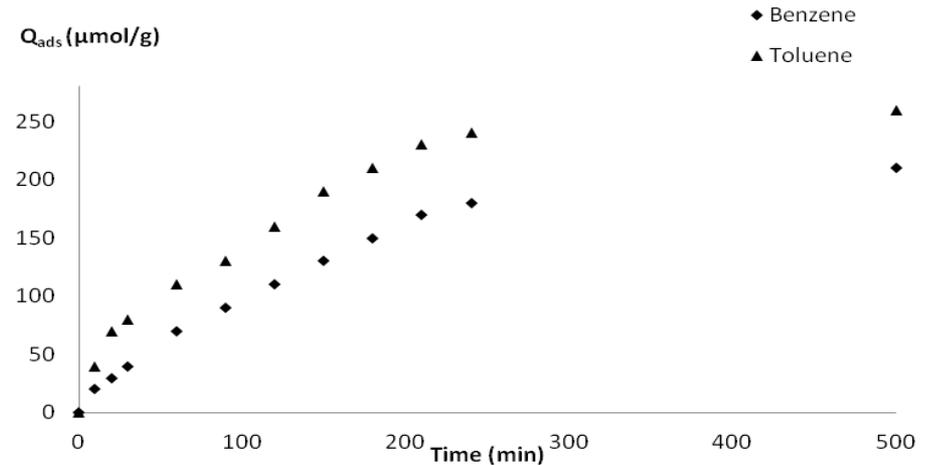
- The chemical processes used to obtain cellulose microfibrils were effective and have reduced considerably the non cellulosic materials such as lignin.
- When the fibres are treated with palmitic acid, the hydrophobic character of pure cellulose samples and jute fibres resulted considerably increased as can be observed in contact angle values
- New peak can be found at 1745 cm<sup>-1</sup>, corresponding to a carbonyl vibration of the ester group formed in the reaction.

# Results

## Multicomponent adsorption



Kinetic data of toluene and benzene adsorption onto modified Avicel  
 $C_{sol} = 1$  (mmol/l)



Kinetic data of toluene and benzene adsorption onto modified microfibrils  
 $C_{sol} = 1$  (mmol/l)

- The adsorption capacity of modified cellulose varied with the aromatic compound used. Thus, the ability of modified cellulose to retain toluene is higher compared with benzene.
- In a multicomponent solution, the ability of modified fibres to retain organic compounds does not vary significantly; the sum of the adsorption capacity is the same as for a single component solution.

# Acknowledgements



Jalel Labidi, e-mail: [jalel.labidi@ehu.es](mailto:jalel.labidi@ehu.es)

***Thank you for your attention***