

# Exam Literature for CHEM-E1150 Biomass Pretreatment and Fractionation – in Class

In this document, you can find the recommended reading – in addition to the lecture slides – for the course examination or the alternative literature assignment. The numbering follows the numbers of the study sessions. Please note that the hyperlinks work only if you are logged in to the Aalto University services.

## 1 Raw Materials

T. Vuorinen (ed.), [Biomass chemistry and physiology](#), ForestBioFacts, 2021  
Selected parts: [Plant cell wall](#) (esp. cell wall biosynthesis), [Chemical composition of biomass](#) (structure of cell wall components)

## 2 Raw Materials

See Session 1 above.

## 3 Chipping and wood yard operations

R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021  
Selected parts: [Wood material handling systems](#) (esp. debarking, chipping, chip storage)

## 4 Presteaming and impregnation

H. Sixta, A. Potthast, A.W. Krottschek, [Mass Transfer in Kraft Cooking](#) (pp. 122-164) in H. sixta (ed.), [Handbook of Pulp](#) – Volume 1, WILEY-VCH Verlag GmbH & Co. KGaA, 2006  
Selected parts: Steaming, Penetration, Diffusion

## 5 Prehydrolysis

J. Lehto, [Acidic pretreatments prior to delignification](#), in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

H. Sixta, Prehydrolysis, (pp. 325 - 366) in H. sixta (ed.), [Handbook of Pulp](#) – Volume 1, WILEY-VCH Verlag GmbH & Co. KGaA, 2006  
Selected parts: P-factor concept

## 6 Hydrothermal Pretreatment

Only lecture slides.

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## 7 Kraft Pulping: Fractionation Chemistry

R. Alén, [Reactions of the wood constituents](#) (including Lignin reactions & Carbohydrate reactions), in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

H. Sixta, Kraft Pulping Kinetics, (pp. 185 - 229) in H. sixta (ed.), [Handbook of Pulp](#) – Volume 1, WILEY-VCH Verlag GmbH & Co. KGaA, 2006  
Selected parts: Introduction, H-factor concept

## 8 Kraft Pulping: Fractionation Technology

R. Alén & V. Lindqvist, [Pulping technologies](#), (inc. Batch cooking & Continuous cooking), in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

## 9 Kraft Pulping: Oxygen delignification and bleaching

R. Alén, [Oxygen-alkali delignification](#) (esp. Chemistry of oxygen, Reactions of lignin, Process configurations) and [Delignifying or lignin-removing bleaching](#) (esp. Principles and definitions, Process configurations) in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

## 10 Kraft recovery cycle

E. Vakkilainen & M. Cardoso, [Chemical Recovery](#), (inc. Recovery boiler, Causticising, Lime kiln) in E. Vakkilainen (ed.), [Energy and Biofuels](#), ForestBioFacts, 2021

R. Alén, [Recovery of cooking chemicals and by-products](#), in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

## 11 Bleaching chemistry

R. Alén, [Delignifying or lignin-removing bleaching](#) (esp. Reactions of lignin, Reactions of carbohydrates, Reactions of extractives, Metal management in pulping and bleaching) in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

## 12 Acid sulfite pulping

R. Alén, [Acid sulphite pulping](#) (esp. Reactions of lignin, Reactions of carbohydrates) in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

H. Sixta, Sulfite Chemical Pulping, (pp. 3922-509) in H. sixta (ed.), [Handbook of Pulp](#) – Volume 1, WILEY-VCH Verlag GmbH & Co. KGaA, 2006  
Selected parts: Introduction, Process Chemistry of Acid Sulfite Pulping

## 13 Organosolv pulping

R. Alén, [Organosolv pulping](#) in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

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#### 14 Pulp washing

R. Alén, [Washing, screening and cleaning of pulp](#) (esp. Mass transfer in washing, Washing Technology) in R. Alén (ed.), [Pulping and biorefining](#), ForestBioFacts, 2021

#### 15 Environmental management & control

O. Dahl, [Environmental control and management](#), ForestBioFacts, 2021 (esp. [Effluent treatment](#), [Best available techniques \(BAT\) and BREF](#))

#### 16 Lignin applications

L.P. Christopher, [Current State and Development](#) (pp.1-66) in [Integrated Forest Biorefineries: Challenges and Opportunities](#), L.P. Christopher (ed.), Royal Society of Chemistry, 2012

- Please note that this reference also contains information about **hemicellulose applications**

#### 17 Pulp Properties

P. Maijanen (ed.), [Material testing and product properties](#), ForestBioFacts, 2021

#### 18 Cellulose applications

P. Nousiainen, [Regenerated cellulose Fibres](#), in P. Nousiainen (ed.), [Man-made bio-based fibre products](#), ForestBioFacts, 2021

L.P. Christopher, [Current State and Development](#) (pp.1-66) in [Integrated Forest Biorefineries: Challenges and Opportunities](#), L.P. Christopher (ed.), Royal Society of Chemistry, 2012

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