

Bioeconomics- course at Äänekosken lukio

(this slide show is our presentation for international Erasmus+ group and at the same time our project diary)

A photograph of a forest floor with tall, slender pine trees. Sunlight filters through the canopy, creating a warm, golden glow and long shadows on the ground. The forest floor is covered in a thick layer of green moss and small plants. The word "Bioeconomics" is overlaid in a large, bold, black serif font in the lower center of the image.

Bioeconomics



Materials

- egg shells
- paper board
- CMC
- biocomposites
- recyclable materials
- pulp

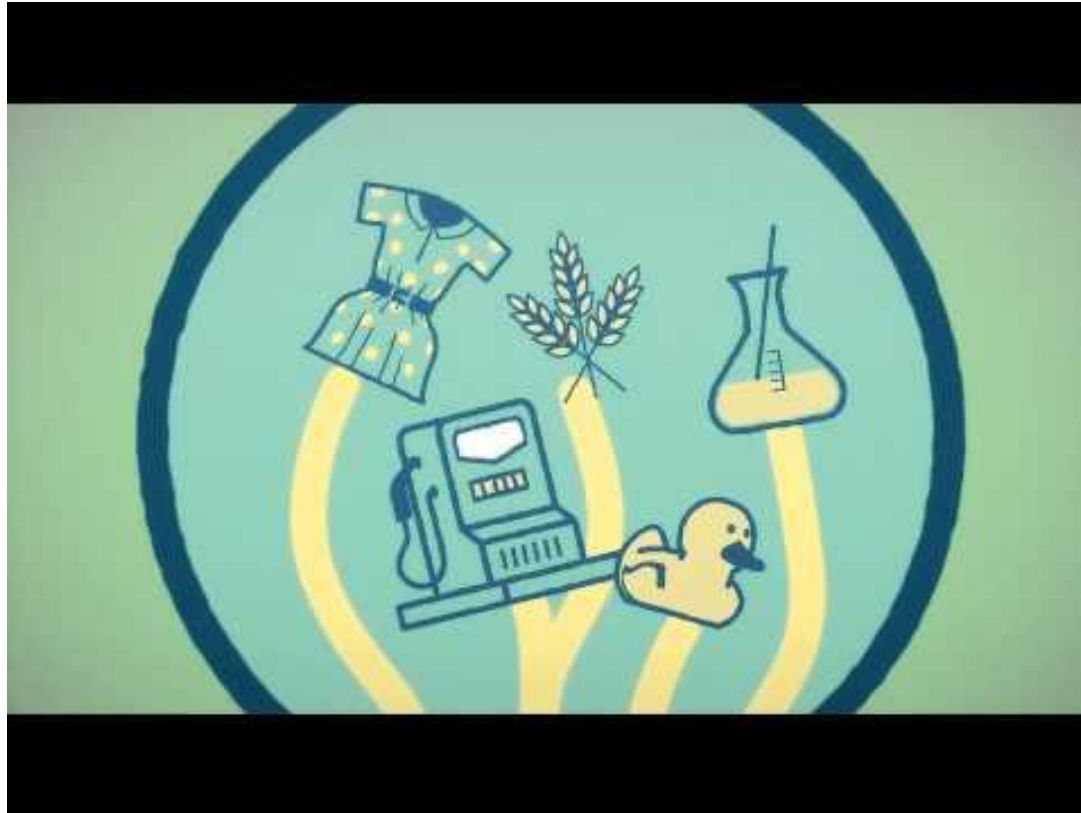
Methods

- acid-base titration
- Gas chromatography
- IR-spectrometry
- X-ray tomography

Visited places

- Metsä Board mill
(production
+Technology Center
-laboratory)
- CP-Kelco
CMC-laboratory
- Kuusakoski recycling
- University of Jyväskylä
- POKE Vocational
College
- Metsä Fibre -bioproduct
mill

What is bioeconomics?



Some of the bioeconomic companies in Äänekoski



CP Kelco in Äänekoski is the biggest mill in the world that makes CMC.



Metsä Fibre makes pulp which is used for example in the paper and in the CMC.



Metsä Wood makes plywood



In Äänekoski there is a factory that makes Aura blue cheese which is the most popular blue cheese in Finland. The factory is also the only one in Finland that produces Aura blue cheese.



Metsä Board makes paper board.



Chef Tommi developes gelatos



Gallup

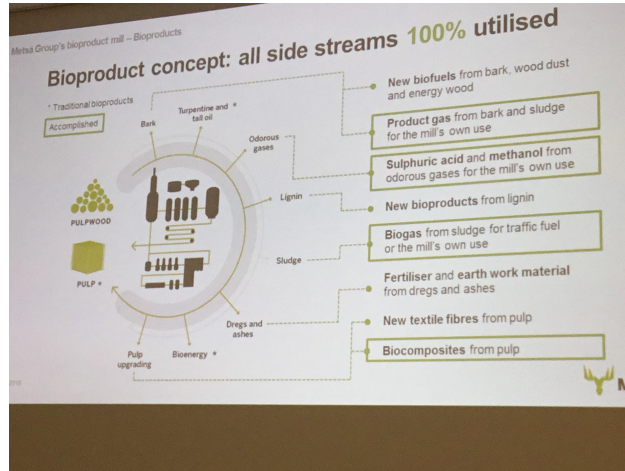
Please raise your hand, if you enjoyed Aura gold gelato (=blue cheese ice cream)

We served local bioproducts to the visitors:
Äänekoski-gelato (Chef Tommi's Aura gold blue cheese ice-cream) in the Metsä paper board cup

in the photo: getting ready



Erasmus-presentation and Metsä Fibre -bioproduct mill 19.1.2018

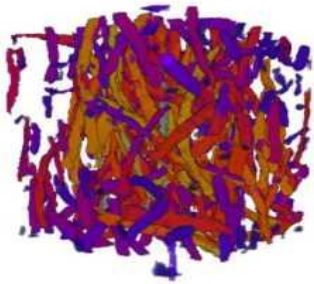


Cellulose fibres and pulp

cards of dried cellulose fibres(=pulp)



Cellulose by x-ray-tomograph



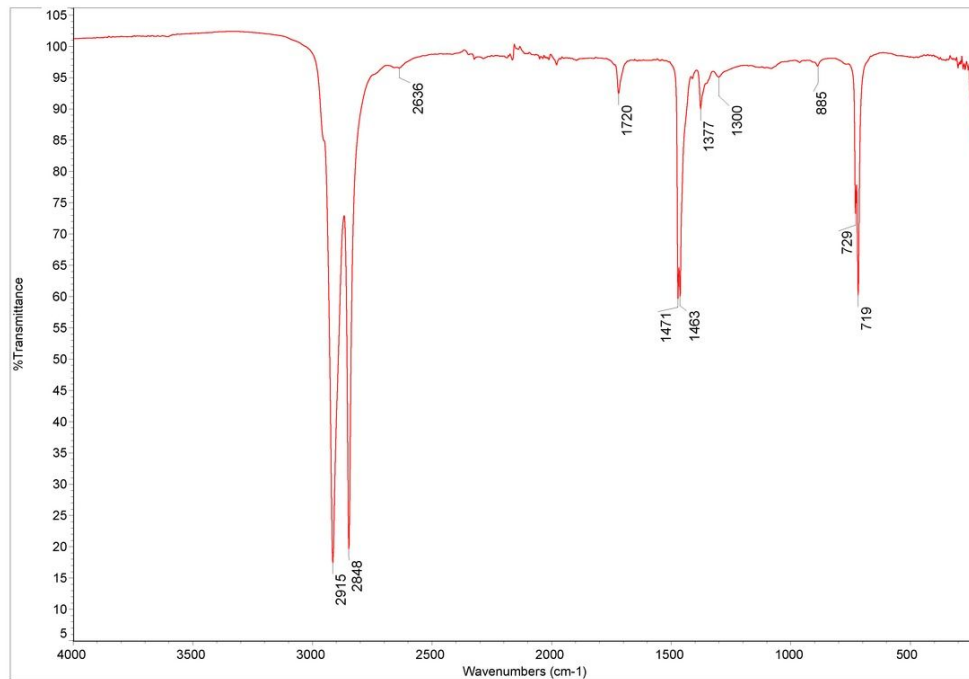
Metsä Board -mill (production 22.11. and laboratory 27.11.)



- general process of making the paper board
- different jobs and education paths
- different laboratory methods for studying the paper board

Infrared spectroscopy

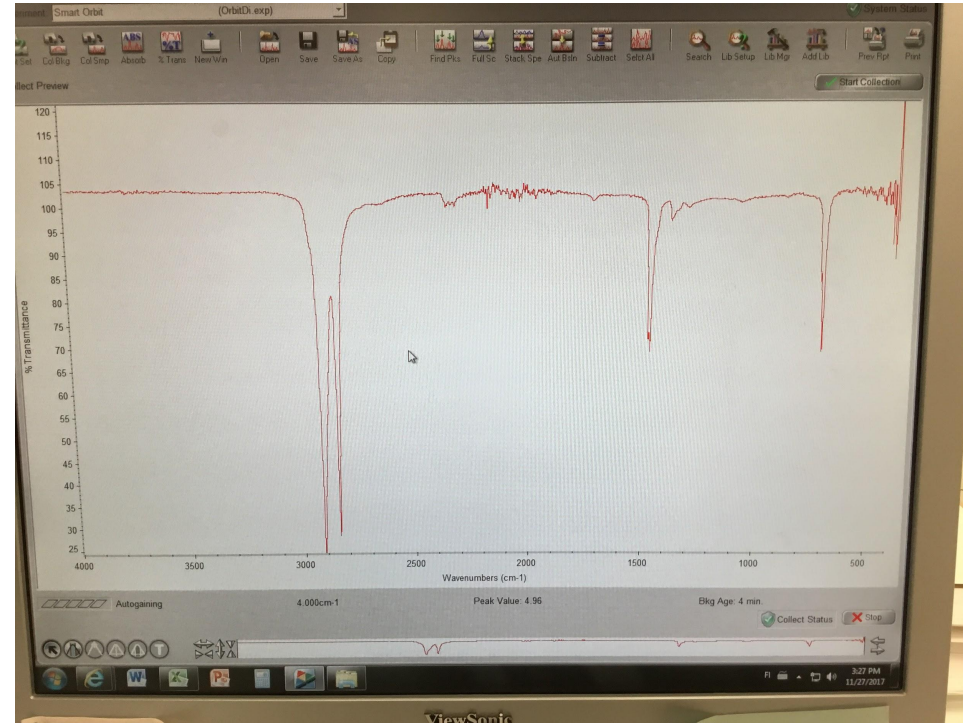
- Infrared spectroscopy measures how much the examined material absorbs infrared light.
- It gives information about different chemical bonds of the organic molecules.
- With infrared spectroscopy you can find out what organic molecules are in your material.
- When you make products, one way to research them is infrared spectroscopy.



PE = polyethene surface on the paper board cup

Wanted qualities for the coating of the paper cup:

- Heat resistance
- Resistance of fluid
- Does not let away smells or tastes



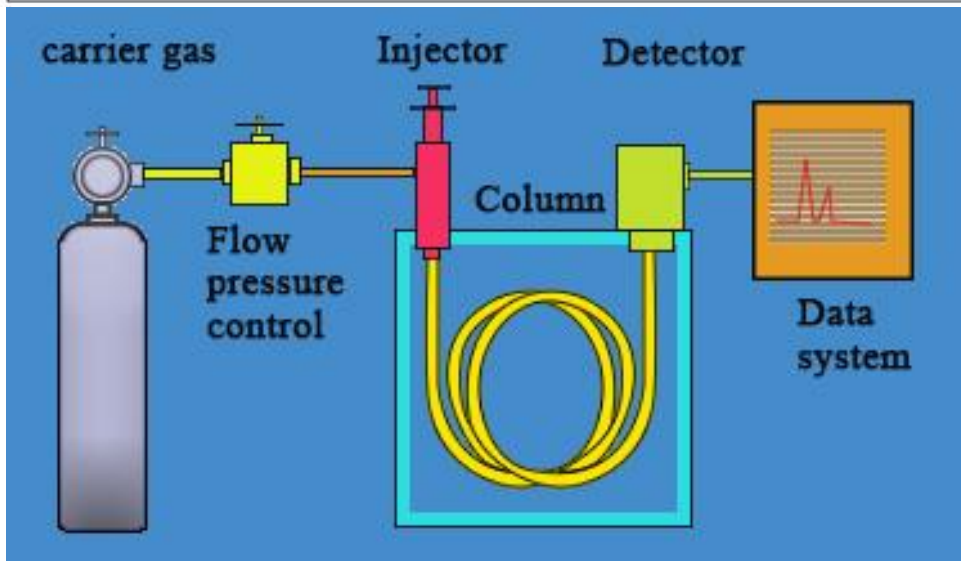
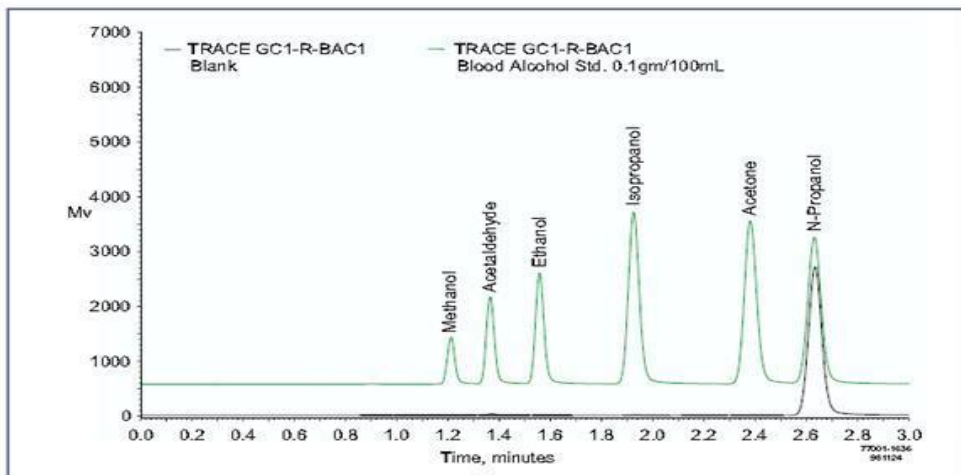
Gas chromatograph at the Metsä Board Technology Center

Gas chromatography

Gas chromatography is used for separating and analyzing compounds.

When the compounds are separated each compound can be recognized.

a sample into injector→the sample turns into gas→carrier gas push the sample through column→different compounds move in different speeds→detector picks up the molecules and sends signals to computer→analyze



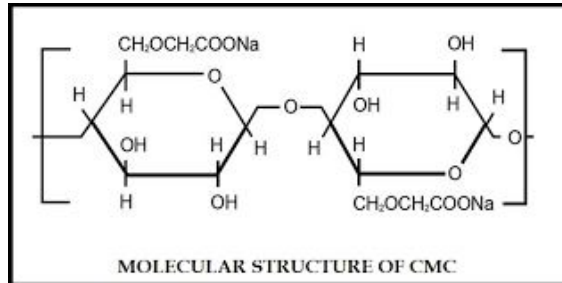
CP Kelco (cmc mill) 8.12.2017



CMC (carboxymethyl cellulose)

It's a chemical which is used in the food industry, pharmaceutical products and in the cosmetics products to modify the viscosity of liquids

In food products CMC is listed as E466



uses of carboxymethyl cellulose

-toothpaste

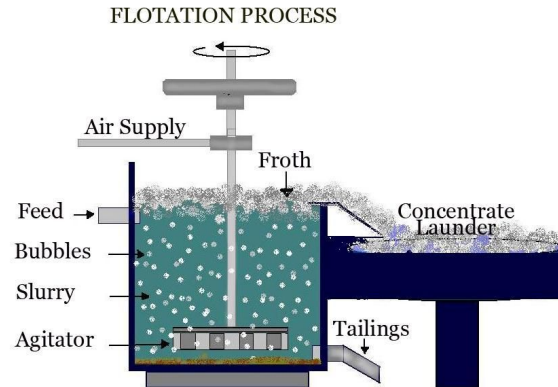
- water-based paints

-ice cream

-soda

-separating metal minerals
(foaming-method)

-oil industry (drilling)



acid-base-titration : 13.11.,17.11.,20.11.

how much does egg shell contain CaCO_3 ?



Common laboratory method of quantitative chemical analysis

1. Dissolve egg shell with acid
2. By titration find out how much acid is left after dissolving (add slowly base until neutralization happens)
3. Calculate the amount of CaCO_3

Acid + base \rightarrow neutralization

Neutralization can be detected by indicator (colour change)

or by pH-meter (show the colour change live).

CaCO_3 is one of the chemicals used in the surface of paper board.



University of Jyväskylä, Department of Physics
11.11.2017

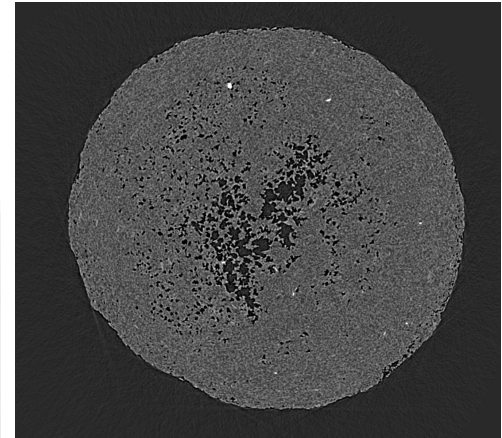
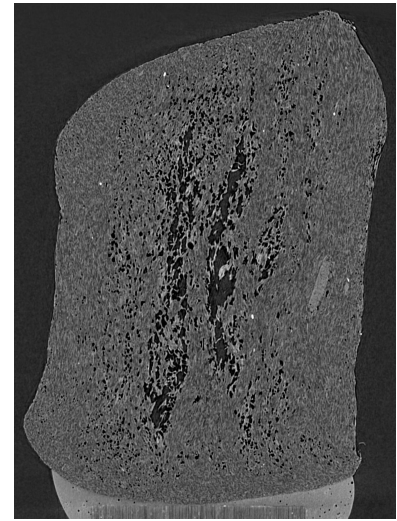
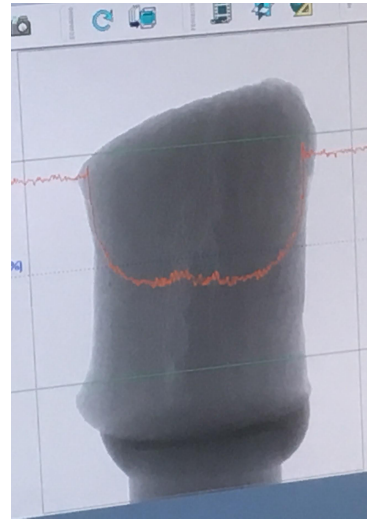


- introduction to the studies in the Department of Physics
- visit to the tomography laboratory
 - microtomography and nanotomography scanners
 - clean room
 - introduction to the biocomposites
- beforehand we sent our own biocomposite sample to be scanned

Biocomposites

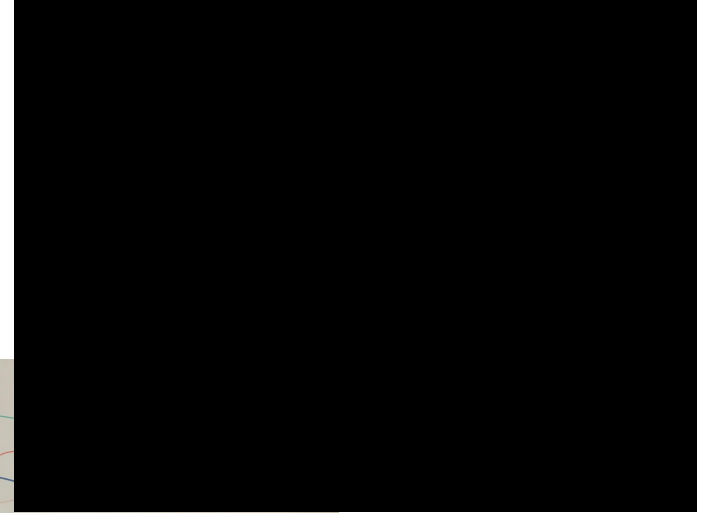
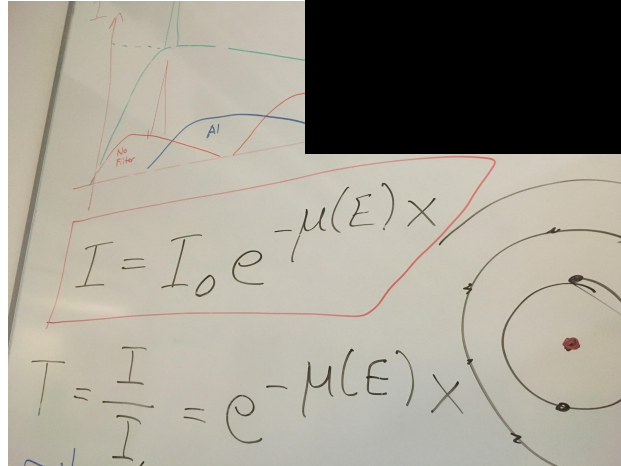
Biocomposites are composite materials that have been made partly from bio-based raw material like pulp.

They are used in the products instead of plastics.



Biocomposite filmed by X-ray microtomography

X-ray microtomography uses x-rays to create a 3D model of an object without destroying that. This method is based on the differences in x-rays going through the materials of the object.





Kuusakoski Recycling 11.12.2017



We got the answers to the following questions:

- how they recycle metals
- how to recognize different metals
- what materials are recycled at Kuusakoski
- how cars are recycled at Kuusakoski

Recycling

Vote by raising your hand:

- do you recycle plastic bottles?
- do you recycle other plastics?
- ...



A photograph of a forest floor covered in green moss and pine needles. In the foreground, a red mushroom with white spots is prominently displayed. Behind it, a yellow mushroom is visible. The background is filled with tall, thin tree trunks, creating a dense forest scene. The text "Any questions?" is overlaid on the right side of the image.

Any questions?

Biotuotetehdas on alusta innovaatioille:

<https://dreambroker.com/channel/g01yqu5c/r7hmeiu4>

(englanninkielinen tekstitys)

<https://dreambroker.com/channel/g01yqu5c/3przgteu>

(englanninkielinen spiikkaus)

Biotuotetehdas on kestävää kehitystä:

<https://dreambroker.com/channel/g01yqu5c/6bv08xa8>

(englanninkielinen tekstitys)

<https://dreambroker.com/channel/g01yqu5c/wxli24go>

(englanninkielinen spiikkaus)

Biotuotetehtaan taloudelliset vaikutukset:

<https://dreambroker.com/channel/g01yqu5c/oyvir66y> (e

nglanti)

Biotuotetehdas on kestävän biotalouden edelläkävijä:

<https://dreambroker.com/channel/g01yqu5c/mx9q4x80>

(englanti)





Thank you!

- 10.11. starting the course, setting goals, the basics of the bioeconomics
- 13.11. getting egg shells ready for acid-base-titration, making flyers for Biopath by Canva
- 17.11. acid-base titration to get the concentration of CaCO_3 using Sparkvue pH-meter and indicator
- 20.11. calculations of the concentration, getting ready for the visit at the paper board mill
- 22.11. Visit to the Metsä Board mill, production
- 24.11. feedback from the visit, preparations for the biopath
- 27.11. visit to the laboratory of Metsä Board
- 1.12. methods: extraction, IR-spectrometry, gas chromatograph, preparations for the biopath
- 4.12. preparations for the biopath
- 8.12. visit to the laboratory of CP-Kelco (CMC-mill)
- 11.12. visit to Jyväskylä: Kuusakoski recycling and x-ray-tomography laboratorio at the University of Jyväskylä (Physics Department)
- <https://www.jyu.fi/fysiikka/en/research/material/tomolab>
- 8.1.2018 Getting ready for the presentation for Erasmus-group
- 15.1 Getting ready for the presentation for Erasmus-group
- 16.1. Getting ready for the presentation for Erasmus-group
- 19.1. the presentation for Erasmus-group and a visit to the bioproduct mill (Metsä Fibre)
- 22.1. preparations for the biopath
- 5.2. making the reports