



CHEMARTS

SUMMER SCHOOL 2018
Aalto University

A close-up photograph of a mossy branch, likely from a tree, showing intricate details of the green moss and the underlying wood. The branch is positioned on the left side of the frame, extending diagonally towards the bottom right. The background is a soft, warm orange-yellow color, creating a high-contrast, artistic effect.

CHEMARTS

CHEMARTS is a long-term collaboration between two Aalto University schools, School of Chemical Engineering (CHEM) and School of Arts, Design and Architecture (ARTS). The schools merged their forces in 2011 with the aim to invest in new ways to harness wood and cellulose. The idea is to research the performance and design of advanced cellulosic materials for innovative uses. The main objective is to inspire students and researchers to explore bio-based materials together and create new concepts for the future use of cellulose and other bio-based materials.

CHEMARTS consists of various actions, such as multidisciplinary study courses, minor studies and externally funded research projects.

CHEMARTS: SUMMER SCHOOL 2018

CHEMARTS 2018 students were free to explore the limits of cellulose based products. With a multidisciplinary group of curious and eager students, this year's program produced diverse experimentation in both products and processes.

The summer began with introductory lectures to the varied and intriguing world of cellulose and the plant life that produces the wonder material. Students held autonomy to find their focus as professors and tutors supported inspiration through demonstrations and their own experimentation. As the course progressed students worked independently or in groups to experiment and feed their curiosities. With the help of CHEMARTS Professors Pirjo Kääriäinen and Tapani Vuorinen, supported by CHEMARTS tutors Nina Riutta, Iina Jakoblev and Jinze Dou, this year's students achieved new heights for themselves and the CHEMARTS program.

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1	CHEMARTS
2 - 3	CHEMARTS: SUMMER SCHOOL 2018
4 - 5	CHEMARTS MATERIALS GLOSSARY
6 - 9	TRANSIENT SURFACES Julia Strandman
11 - 15	DESIGNING COSTUME WITH BACTERIAL CELLULOSE Ingvill Fossheim
16 - 21	RYIJY - BETWEEN WOOD & PAPER Veera Kortelainen
22 - 27	BIODEGREDAABLE TABLEWARE Aurora Tani
28 - 33	BIO - HUES Tito Williams II
34 - 39	GLORY Eugenia Gurina
40 - 45	THE DAILY ITEMS Yesul Woo
46 - 51	EVOL Sushant Passi
52 - 57	WOOLLULOSE Surabhi Nadig Surendra
58 - 63	PADIWALA Miki Todo + Talisa Dwiyani
64 - 69	A SUMMER OF BACTERIAL CELLULOSE Pei Yu Lin
70 - 75	FROM CELLULOSE POLYMERS TO CONTEMPORARY JEWELLERY Ilnes Jakovlev
76 - 77	BOWL Tapani Vuorinen

CHEMARTS MATERIALS GLOSSARY

Acetone: Organic solvent. Pure acetone is a colourless, somewhat aromatic, capable of dissolving many fats and resins as well as cellulose derivatives. - Encyclopædia Britannica

Bacterial cellulose (Kombucha): Kombucha, beverage made of fermented green or black tea, forming a gelatinous mat of symbiotic culture of bacteria and yeast. - Encyclopædia Britannica

Butterfly-pea flower tea: Native to tropical Asia and is a striking blue. That vibrant hue has made it popular as a natural food and drink coloring for centuries - New York Times

Camellia sinensis: Green tea, young leaves and leaf buds of the tea plant. - Encyclopædia Britannica

CaCO₃: Calcium carbonate, it's the major constituent of limestone, marble, chalk, oyster shells, and corals. Its used as a filler in a variety of products, ceramics, glass, plastics, and paint. - Encyclopædia Britannica

Cellulose Acetate: Cellulose acetate, synthetic compound derived from plant substance cellulose. Cellulose acetate is spun into textile fibres known variously as acetate rayon, acetate, or triacetate. It can also be molded into solid plastic. - Encyclopædia Britannica

Cellulose Diacetate: Acetate from a hydrolysis reaction. Diacetate can be dissolved by cheaper solvents such as acetone for dry-spinning into fibres. - Encyclopædia Britannica

CMC: A cellulose derivative added in food products as a viscosity modifier or thickener and emulsifier. - PubChem

Flax: A plant of the family Linaceae, cultivated both for its fibre, from which linen yarn and fabric are made. - Encyclopædia Britannica

Glycerol: A clear, colourless, viscous, sweet-tasting liquid belonging to the alcohol family of organic compounds. Industrial syntheses is based on propylene or sugar. - Encyclopædia Britannica

Hemp: Plant of the family Cannabaceae cultivated for its fibre (bast fibre) or its edible seeds. - Encyclopædia Britannica

Hydroxypropyl Cellulose: a water-soluble derivative of cellulose. - US National Library of Medicine National Institutes of Health

Lamb Wool: Animal fibre forming the protective covering, or fleece, of sheep or of other hairy mammals, such as goats and camels. - Encyclopædia Britannica

MCC: Microcrystalline cellulose is used for industrial purposes is usually obtained from wood pulp and purified cotton linters. - US National Library of Medicine National Institutes of Health

MFC: Microfibrillated cellulose is cellulose fibres disintegrated into their structural components. - US National Library of Medicine National Institutes of Health

Natural Dyes: Plant based substance used to impart colour to textiles, paper, leather, and other materials

such that the colouring is not readily altered by washing, heat, light, or other factors to which the material is likely to be exposed. - Encyclopædia Britannica

Natural Rubber Latex: Elastic substance obtained from the exudations of certain tropical plants. - Encyclopædia Britannica

NFC: Cellulose fibers that have been fibrillated to achieve agglomerates of cellulose microfibril units.
- US National Library of Medicine
National Institutes of Health

Paper Pulp: Raw material for paper manufacture that contains vegetable, mineral, or man-made fibres. It forms a matted or felted sheet on a screen when moisture is removed. - Encyclopædia Britannica

Paper Yarn: Continuous strand of paper fibres grouped or twisted together.
- Encyclopædia Britannica

Pine Cone: Mass of scales or bracts, usually ovate in shape, containing the reproductive organs of certain nonflowering plants.
- Encyclopædia Britannica

PLA: A thermoplastic polyester created using renewable or green sources such as sugar cane, starch and corn.
- Techopedia

Rice straw: Stalks of grass. The term straw denotes such stalks in the aggregate after the drying and threshing of grain.
- Encyclopædia Britannica

Starch: A white, granular, organic chemical that is produced by all green plants. Starch is a soft, white, tasteless

powder that is insoluble in cold water, alcohol, or other solvents.
- Encyclopædia Britannica

Sugar: Sweet, colourless, water-soluble compounds present in the sap of seed plants and the milk of mammals and making up the simplest group of carbohydrates.
- Encyclopædia Britannica

Turmeric: Plant of the ginger family. Used from antiquity as a condiment, a textile dye, and medically as an aromatic stimulant. - Encyclopædia Britannica

Yeast: A 1,500 species of single-celled fungi. - Encyclopædia Britannica

Vinegar: Sour liquid that is made by the fermentation of any of numerous dilute alcoholic liquids into a liquid containing acetic acid.
- Encyclopædia Britannica

Water: A substance composed of the chemical elements hydrogen and oxygen. - Encyclopædia Britannica

Wood: The principal strengthening and nutrient-conducting tissue of trees and other plants and one of the most abundant and versatile natural materials. - Encyclopædia Britannica

Wood Sawdust: The dust and small pieces of wood that are produced when you cut wood with a saw.
- Cambridge Dictionary.



TRANSIENT SURFACES

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Motivated by environmental and ethical issues of the fashion industry, *Transient Surfaces* is born from the need to replace fossil oil based materials (ex. PU and PVC). The goal became to create a cruelty free, biodegradable, leather-like material. Explorations with NFC, growing bacterial cellulose and kombucha are used to develop the structure of NFC fiber films to make suitable for clothing. Through extensive experimentation and development a dress of clasped pieces of NFC films, is the final product. Though incredibly unpredictable, the material creates a level of spontaneity and life in the final piece.

Materials: NFC, bacterial cellulose, kombucha













DESIGNING COSTUME WITH BACTERIAL CELLULOSE

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Designing costume with bacterial cellulose explores how material may serve as a collaborating material in contemporary dance.

Ingvil Fosshim looks to bacterial cellulose as a communicative material to the philosophical topics and questions that sit at the core of her collaboration with *Post-human days at Zodiak*, a production presented by the Centre for New Dance. The performance is inspired by the topical philosophical writings of; Donna Haraway's *Cyborg Manifesto* (1985) and Rosi Braidotti's *The Posthuman* (2013), and asks: What is a post-human human being? What does it mean to let go of anthropocentrism?

A variety of bacterial cellulose was cultivated through experimentation. Cellulose and performer interactions took place throughout rehearsals for the performance, and the cellulose material became an integral component of devising process of the piece. This costume design process allowed for dialogue between material, body and choreography, evolving the bacterial cellulose design through interaction, feedback and distribution of agency.

Materials: symbiotic culture of bacteria and yeast, *Camellia sinensis*, sugars, water













RYIJY - BETWEEN WOOD & PAPER


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As a Graphic designer Veera Kortelainen works closely with conceptual messages. With a love for poster design, Kortelainen applies her passion for artistic messaging to a traditional finnish ryijy or rug. As these traditional rugs are often inspired by depictions of nature, Ryijy is a visualisation of the versatility of cellulose. Ryijy is a wall rug which displays a gradient of material evolution between wood and paper.

Materials: MFC, NFC, CMC, cellulose acetate, mixed wood sawdust, paper pulp, paper yarn, wooden sticks















BIODEGRADABLE TABLEWARE

Aurora Tani

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Light weight disposable plates and forks are easy to carry and use as an alternative to traditional tableware when camping outdoors. Despite their pros, their thin plastic film atop their surface is not biodegradable and therefore will cause excess waste.

Inspired by a void in fully biodegradable disposable tableware Aurora Tani produces an alternative to disposable plates derived from nature to one day return to nature again.

Materials: MFC, willow bark, pine bark, wool, moss











BIO - HUES

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Colour brings new dimensions to how we see and experience the world. What if we could colour our world of products with eco friendly and bio - degradable pigments derived from nature? *Bio - Hues* is an experimentation of colouring polylactide (PLA), a Bio - plastic produced from milk protein, with natural dyes for a line of sustainable eye-wear. Maple Leaf (green), Beet Root (pink) and Turmeric (yellow) produced a pallet derived from nature herself. The pigments are melted into the PLA to produce large drips of the plastic, they are then ground, reheated and extruded to create a filament for 3D printing eye-wear prototypes. As this project lives after CHEMARTS we may one day view the world through natures hues.

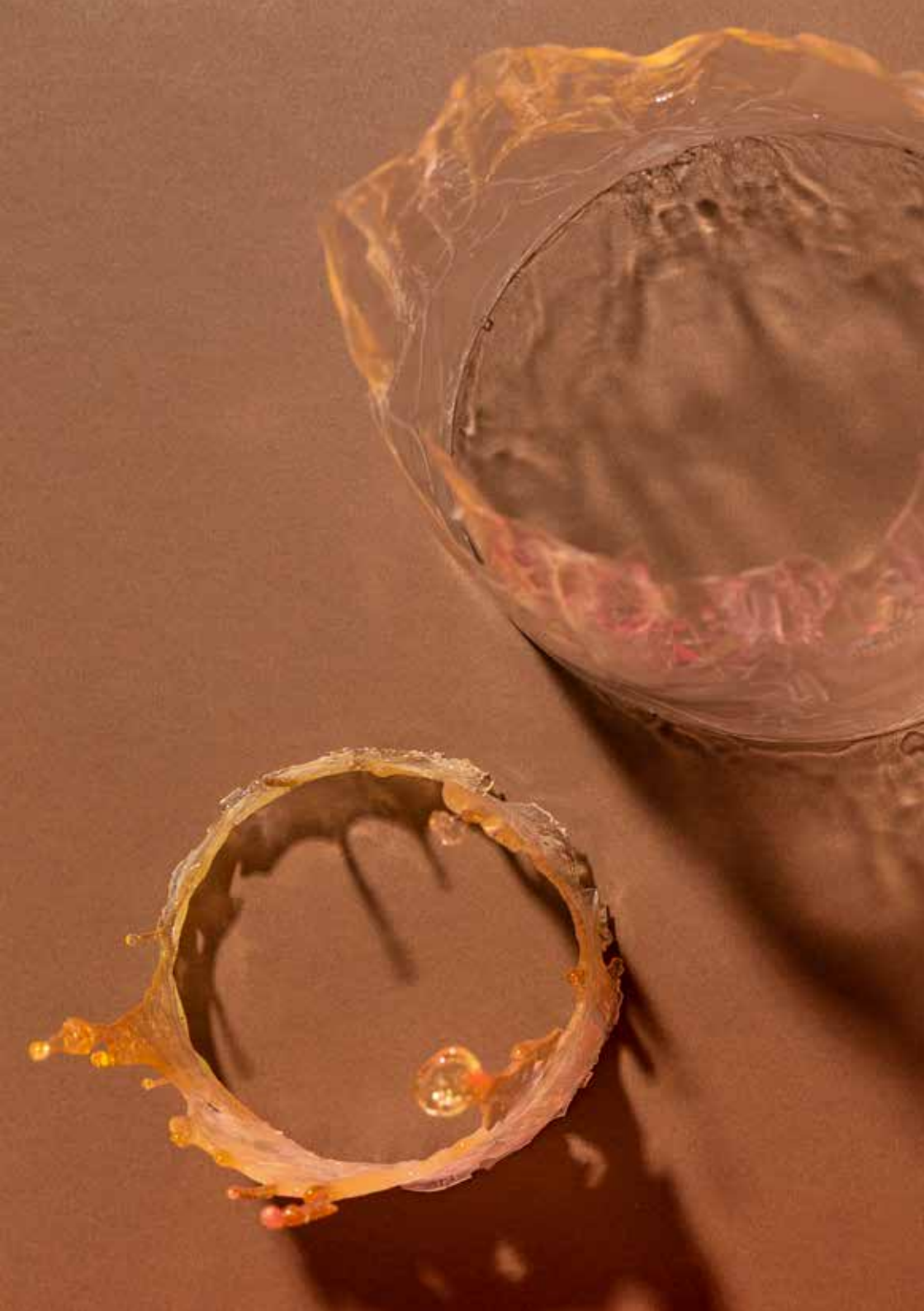












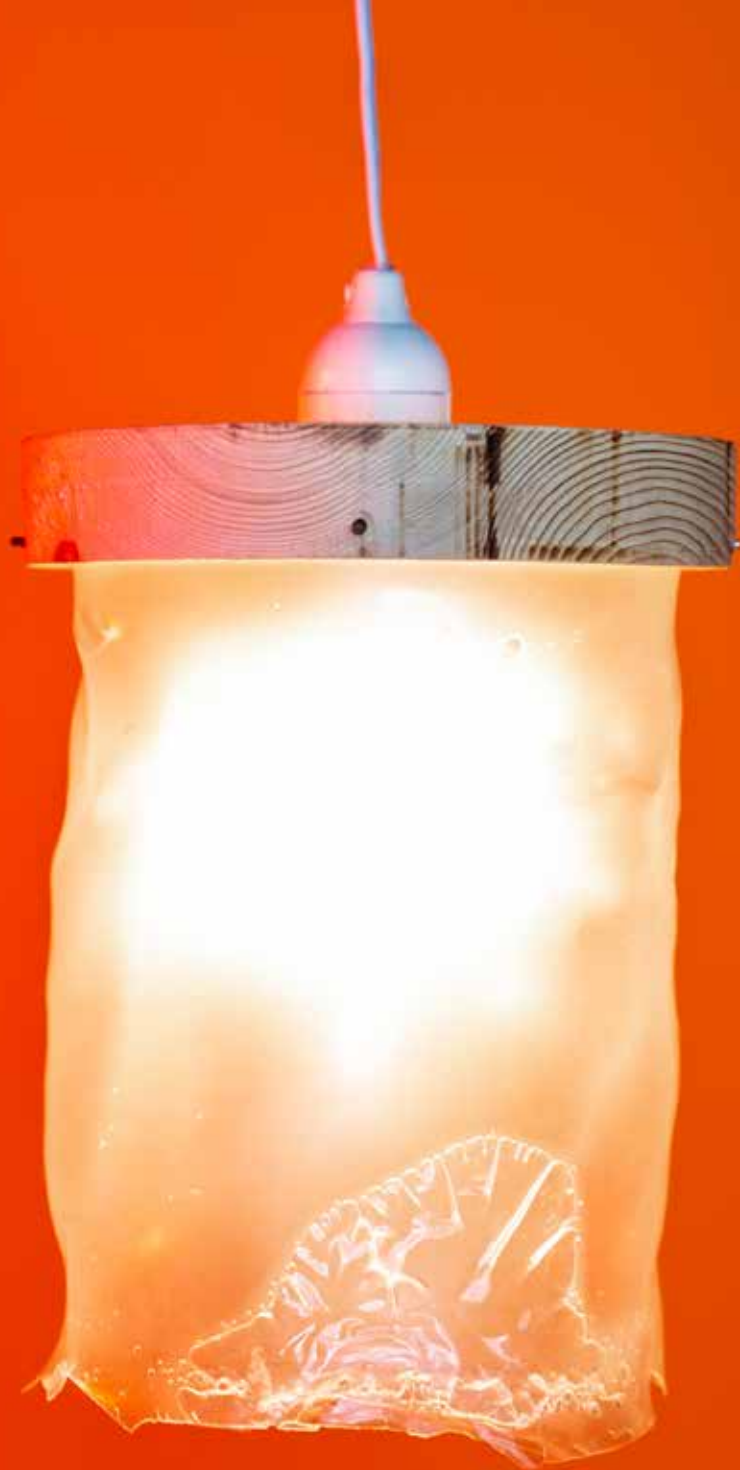


GLORY

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GLORY is a series of lampshades that reflects a natural beauty of our planet. Transparent and tinted surfaces mimic the aesthetics of melting ice and snow in springtime. Minimalistic wooden details underline the warmth of natural materials, while its cylindrical shape makes these lampshades cosy and fashionable. The light behaviour of each lampshade is unpredictable. As the process of creation is always a matter of chance, it is impossible to guess or control changes and behaviour of the material.

Materials: Cellulose diacetate, CMC, starch, hydroxypropyl cellulose, paper rope











THE DAILY ITEMS

Yesul Woo

M.A. Fashion Clothing and Textile

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Nature is omnipresent, fashion Designer Yesul Woo learns while discovering hidden stories behind objects and materials.

Enthralled by nature's presence in the daily lives of people, Woo explores MFC and cellulose diacetate for the use in daily products. A transparent bag and pouch, *The daily items* are such a product. The waterproof cellulose diacetate handbag coupled with a woven clutch made from MFC, serves as an example of nature in our everyday products.

Materials: MFC, hemp, straw, acetone, acetate, cork fabric













EVOL

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Evo/ is a series of material explorations with cellulose materials derived from trees and natural rubber latex. The intention of *Evo/* is to explore the properties of these materials for ecologically sustainable production.

After a variety of material experiments where cellulose based materials like; paper pulp, microfibrillar cellulose, micro-crystalline cellulose and natural fibres are combined with natural rubber latex Passi, creates a leather-like biodegradable material. This exploration produced a myriad of materialities, inherent colours and stunning textures, for product application discoveries.

Materials: MFC, MCC, paper pulp, CMC, natural rubber latex













WOOLLULOSE

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Driven by a beloved feeling of nostalgia from a shepherd's hut surrounded by humble sheep, Surabhi Nadig Surendra pays homage to the memory with woollulose. Combining wool and cellulose to discover new textures and shapes by blending the two materials. Processes of heating and pressing the blend give birth to shape and texture resulting in brilliant material studies conceived in nostalgia.

Material: MFC, NFC, glycerol, CMC, lamb wool
Natural dyes: turmeric, pine cone











PADIWALA

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Coming from the same continental background Designers Miki Todo and Talisa Dwiyani delve into the application of rice straw as waste material in Asia. A cultural fusion births Padiwala, a contemporary sustainable material study for the future.

Material: NFC, rice straw, CaCO_3













A SUMMER OF BACTERIAL CELLULOSE

Pei Yu Lin

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A Summer of Cellulose aims to explore the application of bacterial cellulose into data visualization. By exploring methods to grow bacterial cellulose, Pei Yu Lin develops a paper-like material. In a plan of data on data inception Lin looks to one day create a visual poster of cellulose growth on bacterial cellulose Paper.

Materials: Bacterial cellulose (Kombucha), butterfly-pea flower tea, green tea, sugar, vinegar, NFC, paper pulp, natural fibres.













FROM CELLULOSE POLYMERS TO CONTEMPORARY JEWELLERY

Ines Jakovlev

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As teaching assistant, Ines Jakovlev dives further in to the world of cellulose as contemporary jewellery. Inspired by microscopic images of her own samples.

Jakovlev allows the material to freely find its own form and shape giving it freedom to curl and bend while drying. In line with its conception Jakovlev will allow the material to find its own place from the body.

Materials: NFC, MFC, MCC, CMC, pulp











BOWL

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Knowledge, hands and eyes are Tapani Vuorinen's tools for exploration. Vuorinen allows a sudden thought to lead him into a flow of experimenting and learning. *Bowl* is simple, beautiful and easy to communicate.

Materials: MFC, flax





CHEMARTS

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