Master Thesis:

Title: Optimization of the Nano Cellulose production using homogenisation

The use of environmentally friendly, renewable, and sustainable biomaterials is becoming increasingly important. This area of research has attracted the interest of academy and industry because such materials are one solution to resource depletion, environmental pollution, global warming, and the energy crisis. Moreover, biopolymers are essential in biomedicine and nutrition. In this context, so called nanocelluloses and other nano bio polymers (chitin/chitosan, polyesters) are considered promising. **Those are isolated as nano-particles, very thin fibres, or crystals from ubiquitous renewable biopolymer sources; example cellulosic sources (e.g., wood, algae, bacteria (also polyesters), tunicates).**

These materials can be sourced from conventional agriculture and forestry, but more importantly, can be obtained through industrial biotechnology in the future. They are biodegradable and **combine stiffness with high strength, low thermal expansion, low density, high dimensional stability, and can be modified during and after biosynthesis or processing**.

Due to these properties, **nano-fibrillated celluloses (NFC)** or **nano crystalline celluloses (NCC)** and other nano- biopolymers are expected to appear in various markets soon. These include paper, pulp and packaging, composites, sound and thermal insulation, batteries and fuel cells, sensors, tissue regeneration, 3D printing, drug delivery, cosmetics, and food.

NFC and NCC can be produced in larger quantities from biogenic fibres (using a high-pressure techniques known as **fluidizing or homogenizing processes** as a core technology. Pre- and post-treatment equipment for nano-fibre production is necessary as listed above and consist of feedstock, pre-processing, core-processing, characterization/analytics.

In Master Thesis:

- different pre-treatment processes (chemical, enzymatic)
- different conditions parameter using Homogenisation technique (time, pressure, concentration…)

will be studied in order to **optimize the production process of the tuned NFC and NCC**, which will be produced first time at IBioSys labs using new **Homogenizator** installed in our labs recently. https://www.tugraz.at/institute/ibiosys/equipment/ibiosys-lab.

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