**Nanocellulose Lab Demo**

**Masuko grinder**

MASUKO (MKZA10-20J) grinder with a stone diameter of 200-300 mm and a through put of 150-2000 kg/hr (wet) is used for nanocellulose processing. A pretreatment of cellulose suspensions with high shear mixers is recommended before the use of the Masuko grinder. The recommended suspension concentration is 1-2 wt%. The Masuko grinder is equipped with nonporous grinding stones containing silicon carbide and it is possible to change the rotational speed and the gap clearance between the stones which make possible to adjust the condition for fibrillation. The quality of nanocellulose from the Masuko is varying. Several chemical pretreatments and post treatments could increase the quality of the product.

**Microfluidizer**

The high pressure microfluidizer is also used for nanocellulose fibrillation. It is equipped with a single 100 μm-wide chamber and is operating at 1500 bar. Cellulose suspensions are usually pretreated with high shear mixers and are diluted in concentrations below 0.5 wt%. This machine is used to produce highly fibrillated material at lower volume. It generates an intense shear force inside the chamber, making it possible to homogenously break down and fibrillate single cellulose fiber at nano level.

**Lab-scale reactors**

We have available two reactors, 2 and 5 L made of glass to allow biomass and textiles processing at both alkaline and acidic conditions. The reactors have a heated jacket allowing reactions at elevated temperatures of 200 oC. The biomass should be preferably grinded to a fine powder beforehand as a pretreatment to be able to process it effectively in the reactor.

**3D-printers**

Different types of 3D printers are available at SU for cellulose material designing. Ultimaker Fused deposition modelling 3D printers such as 5s and 2+ are used for filaments printing. An Ultimaker 2+ 3D printer coupled with Discov3ry Complete paste extruder is used for 3D printing of gels and pastes and byflow focus 3D printer is a direct ink printer which is also used for material designing. The printing can be carried out at room temperature and elevated temperatures depending on the printing material.



