

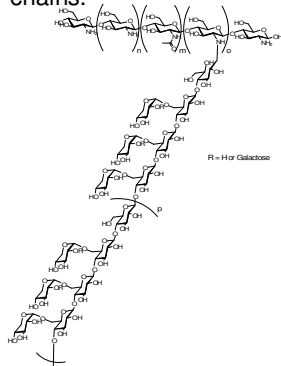
# Novel Methods to Introduce Functionality to Cellulose

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## GripX™

GripX™ is a recent invention developed at SweTree Technologies<sup>1</sup>. The novel comb-co-polymer presents a unique ability to adsorb to cellulose. GripX™ consists of a primary amine functionalized polymer and a hemicellulose. A structural example of the GripX™ macromolecule family is a backbone of chitosan with xyloglucan (XG) as side chains.



The primary amines along the chitosan backbone enables the introduction of beneficial groups to the polymer. The xyloglucan side chains contribute with its high solubility in water and the intrinsic high affinity to cellulose. GripX™ is readily adsorbed to cellulose e.g. wood or cotton fibers in the form of pulp, paper or textile.

### Benefits

- Comb-co-polymer of two naturally derived polymers
- Excellent adsorption to cellulose materials
- Multivalency
- Tunable solubility in water over a wide pH range
- Versatile functionalization

Results show that when GripX™ is used as a wet end additive to pulp the toughness of the paper increases dramatically (Fig. 1). GripX™ has also been used to introduce a vast number of different functionalities to cellulose (example in Fig. 2).

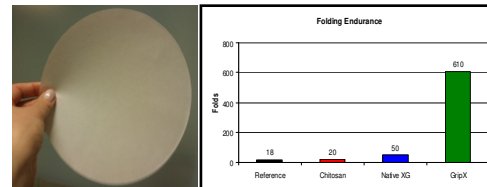


Figure 1. Rapid Köthen standard hand sheet made of unrefined pulp with 2% loading of chitosan, native XG, or GripX™.

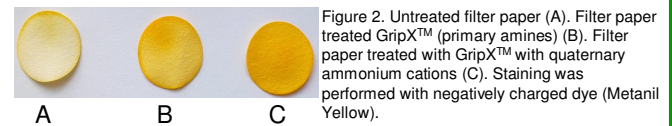


Figure 2. Untreated filter paper (A). Filter paper treated with GripX™ (primary amines) (B). Filter paper treated with GripX™ with quaternary ammonium cations (C). Staining was performed with negatively charged dye (Metanil Yellow).

### Applications

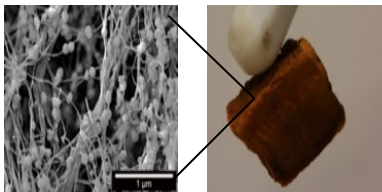
- Pulp and paper
- Packaging, specialty paper
- Textile
- Hygiene and clinical applications
- Medical devices and biotechnology products

Reference

1. Patent WO2010/138069,

## Non-aggregated Nanomagnetic Cellulose

An innovation in SweTree Technologies' portfolio is Magnetic Cellulose<sup>1</sup> based on research by Berglund *et al.*<sup>2</sup> (Royal Institute of Technology, Stockholm, Sweden). Magnetic cellulose is obtained by precipitation of metal salts onto a cellulose template. The cellulose source can be originated from bacterial cellulose, in the form of a hydrogel or aerogel, or microfibrillated cellulose.



References

1. Patent US2010203313, Magnetic nanoparticle cellulose material
2. R.Olsson, *et al.* Nature Nanotechnology 2010, Vol. 5, p. 584–588

## Nanocellulose Films with High Toughness

The innovation is based on work by Berglund *et al.* (Royal Institute of Technology, Stockholm, Sweden), in which cellulose nanofibers are used to produce cellulose nanofilms with high toughness.<sup>1-3</sup> The cellulose nanofibers can either be microfibrillated cellulose disintegrated from wood fibers or bacterial cellulose (BC) nanofibers.

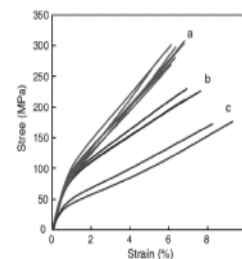


Figure 3. Stress-Strain curves of nanofilms prepared from bacterial cellulose produced in the presence of polysaccharide (a), unmodified BC (b), and a blend of BC and polysaccharide (c).

References

1. Patent US2010/0065236,
2. M. Henriksson, *et al.*, Biomacromol, 2008, 9, p. 1579
3. Q. Zhou *et al.*, Soft Matter, 2009, 5, p. 4124

SweTree Technologies is a plant and forest biotechnology company. We are a technology provider offering products or technology alliances turning innovation and know-how into high value products.



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