Kraft lignin based carbon fibres

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Abstract

Several research projects have been focused on converting lignin to carbon fibres at RISE Bioeconomy (former Innventia). The focus on the work has been on melt spinning of kraft lignin into filaments which were subsequently converted to carbon fibers. Using kraft lignin as a precursor for carbon fibres gives a sustainable product that has the potential to be manufactured at a low cost. The good availability and the low cost of the kraft lignin raw material are two major advantages when manufacturing lignin based carbon fibres. This poster will show selected results from resent research and development at RISE.

Lignin based carbon fibres with improved properties

During the last years new equipment was invested in and installed at Innventia and in doing so we have manged to improve the properties of our lignin based carbon fibres. In the present research project (Innventia research program 2015-2017) financed by the Swedish energy agency and pulp and paper companies we can now produce carbon fibers with equal or even better properties compared to published data on lignin based carbon fibers [1,2]. In **Figure 1** a data set is shown for a melt spun softwood kraft lignin that was converted to carbon fibres. The tensile strength has an average value of 952 MPa and the Youngs modulus average value is 69GPa

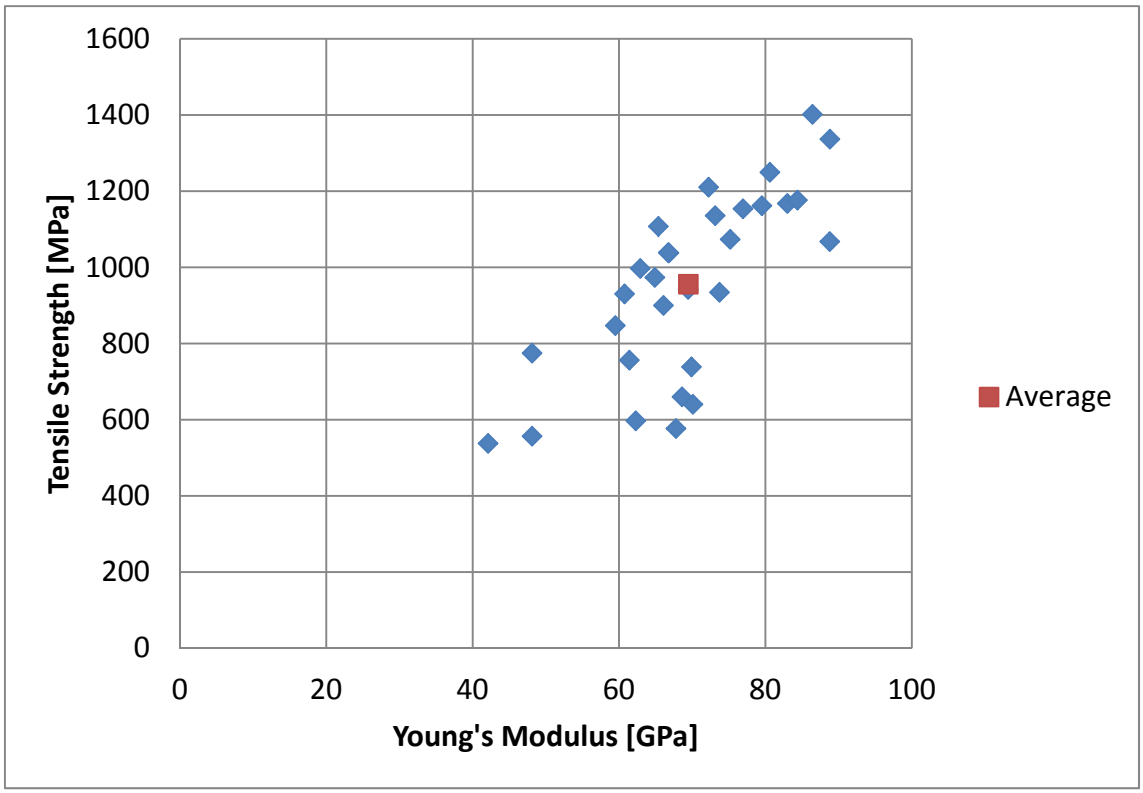

***Figure 1**. Mechanical properties of carbon fibers from 100% softwood kraft lignin.*

Lignin based carbon fiber demonstrator

A toy car demonstrator was produced in a project financed by the Bioinnovation a strategic research program by VINNOVA, Formas and the Swedish energy agency. The demonstrator project was coordinated by Innventia and was a cooperative project involving Blatraden, KTH and Swerea SICOMP cofounded by industrial partners of the Innventia research programme. The existing roof of the toy car was replaced with a roof consisting of a carbon fibre composite where the carbon fibres were made of 100% softwood kraft lignin. The toy car was also equipped with a lithium ion battery having a negative electrode containing lignin based carbon fibres. The toy car shown in **Figure 2** below is a big step towards the vision of the manufacture of light weight forest based material in the future of bioeconomy.

***Figure 2**. Lignin based carbon fibre demonstrator.*

References

1. Baker D, Rials T: *Recent advances in low cost carbon fiber manufacture from lignin.* J Appl Polym Sci, 2013, vol 130, p. 713.
2. Zhang M, Ogale A: *Carbon fibers from dry-spinning of acetylated softwood kraft lignin.* Carbon, 2014, Vol. 69, p. 626.