

Time-domain $^1\text{H-NMR}$ measurements of carbon fibre samples (revised in 2012)

1. Aim of investigation:

To explore the possibility of Time-domain NMR application in characterization of rubber content in carbon/rubber cords.

2. Samples:

- Carbon fibre T700SC (Untreated)
- Rubber impregnated carbon fibre G10-0-40223 (Treated)

Samples were cut to stripes of equal length of 10 cm and put into glass test-tubes.

3. Hardware:

Spin Track NMR Analyzer with standard 10-mm tube sensor.

4. Software and experiment-type:

Relax v 6.201.

Pulse sequence: Free Induction Decay (FID) after a single excitation pulse.

3 scans averaged

5. Results:

The untreated sample showed nearly no $^1\text{H-NMR}$ response but the treated one demonstrated well observable relatively weak FID magnitude. This magnitude is directly proportional to the amount of hydrogen nuclei in the volume of sample. Roughly calculated proton density is around $\sim 7.8 \times 10^{21}$ ^1H nuclei per meter.

Below are shown screenshots and the graph of comparison of NMR signals.

From the first appreciation it seems that water content of samples is very low if refer to other majority of carbons types.

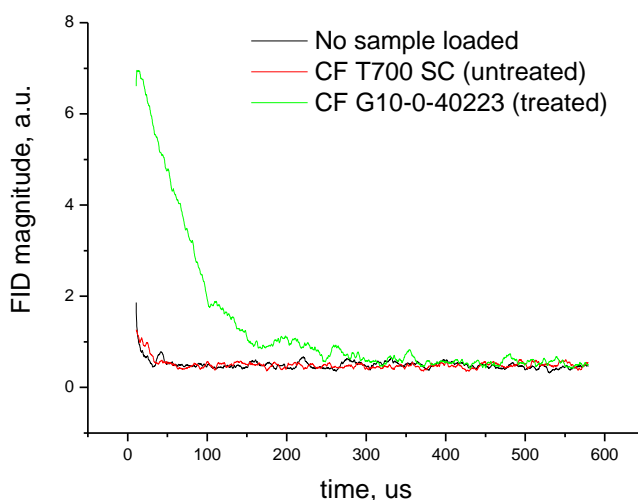


Fig.1. Comparison of NMR FID signals (see explanation on graph)

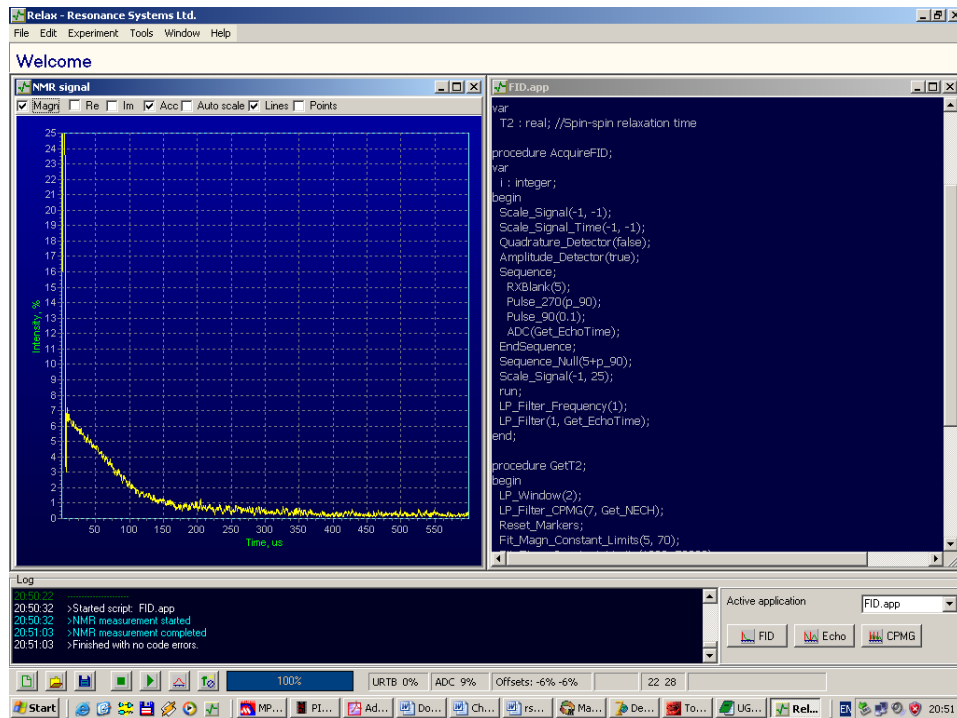


Fig.2. Screenshot of NMR FID signal from the treated sample

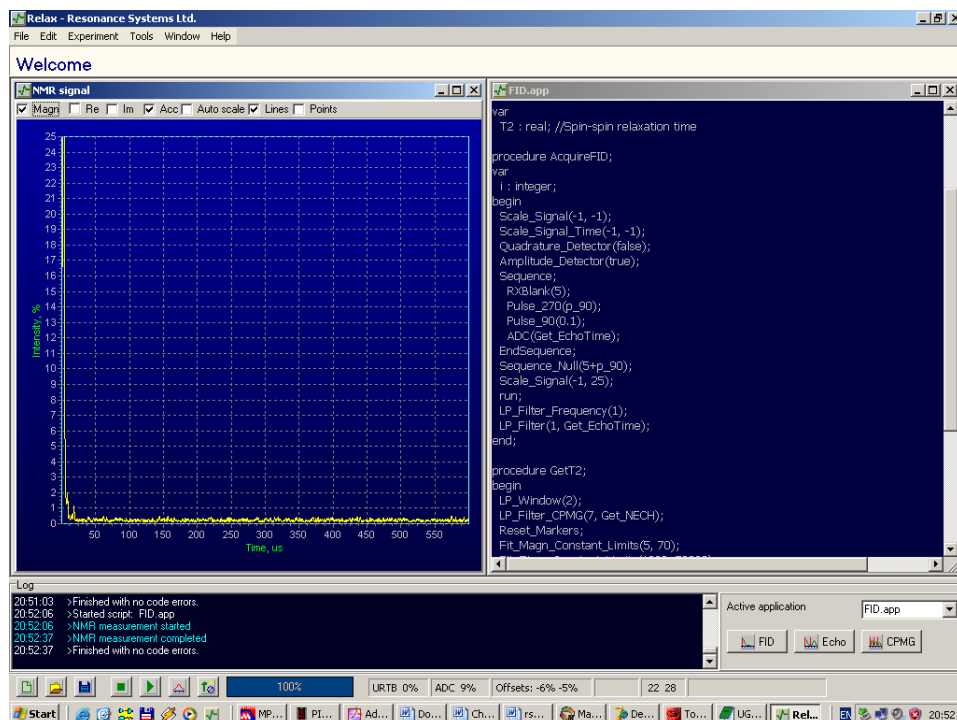


Fig.3. Screenshot of NMR FID signal from the untreated sample

6. Conclusion

Time-domain ^1H -NMR can be applied to characterize rubber impregnated carbon fibers. Results of measurements can be expressed in [amount of protons/length] or [amount of

protons/mass] units. If the carbon content is known the results, of course, can be calibrated to percent ratio of rubber/carbon.

7. Contacts

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