***Off-Line dn/dc* Measurement in Organic Solvents**

***Challenges***

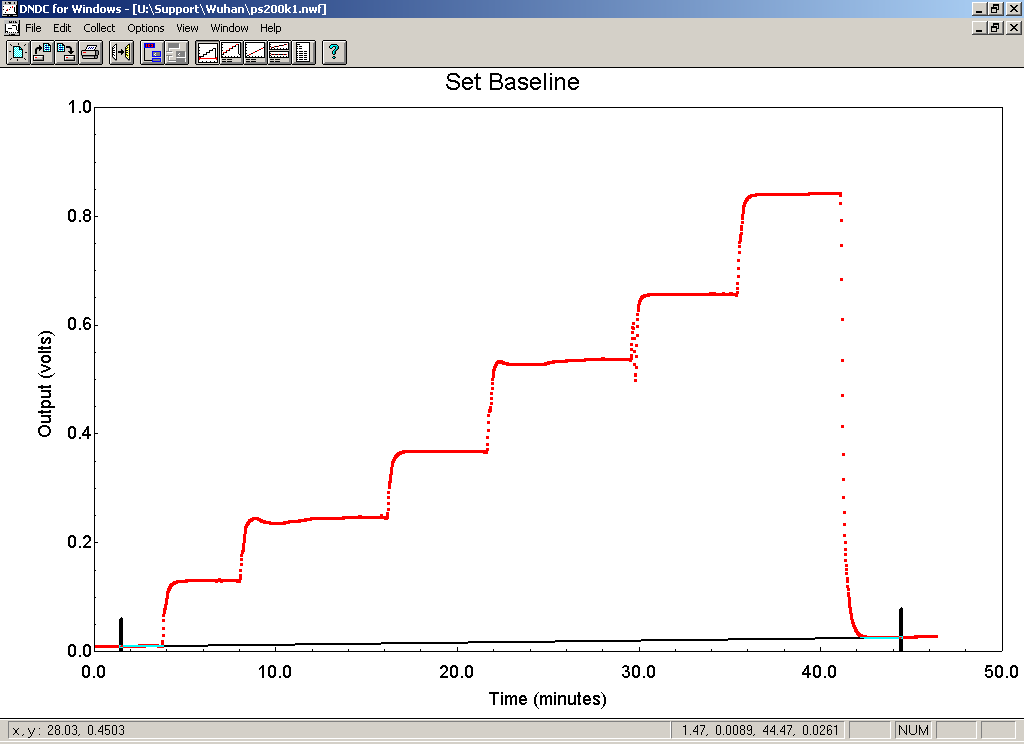
* Differential refractive index (DRI) detector is sensitive to all species, including dissolved air and moisture, at a detectable concentration which can be as low as 1 ng/mL.
* Organic solvents often have very good solubility for air.
* Many organic solvents have low boiling points and their quick evaporation calls for quick measurements before sample concentration is altered.
* Many organic solvents are hygroscopic and may undergo chemical reactions when exposed to air and light. For example, DMSO is very hygroscopic and THF without inhibitor may undergo oxidation once exposed to air and light.
* Some organic solvents are so strong that they may dissolve things in the fluidic path and carry them to the flow cell of the DRI detector.

***General Strategies***

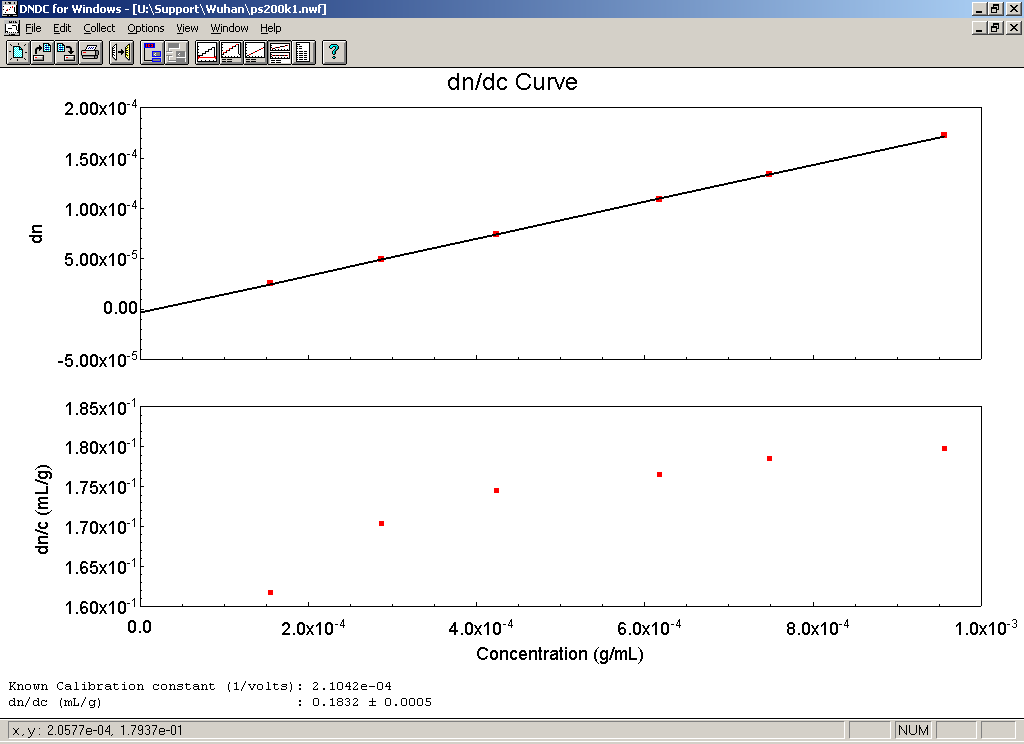
* Practice *dn/dc* measurement with sodium chloride in water as detailed in hardware manual to confirm that your basic technique is validated.
* Understand any unique properties (such as reactivity, hygroscopicity, and boiling point) of the solvent in which you are going to measure *dn/dc*.
* To avoid the change in the amount of dissolved air and moisture, saturate the solvent bottle/flask with air and moisture by stirring it for a day or two. Or use containers with screw-on caps.
* Use an inhibitor with reactive solvent, like BHT for THF.
* Make all solutions from the same solvent bottle/flask.
* Maximize the stock concentration (if the expected *dn/dc* is around 0.18 mL/g, use a stock concentration of 1 mg/mL; if *dn/dc* is around 0.1 mL/g, use a stock concentration of 1.8 mg/mL) and cover one-order of magnitude for the concentration range.
* Prepare samples in volumetric flasks. Try to collect all data within one to two hours.
* Use glass syringe with Teflon plunger whenever possible.
* Rinse the cleaned syringe with plenty of new solution before injecting.
* Filters are not recommended as long as the solution is clean. When filters are used, make sure that the filters are compatible with the solvent.

***A case study: 200 kD Polystyrene (PS) in THF***

1. Use THF with BHT as inhibitor. Take 250 mL out from a bottle into a clean flask and stir overnight with the flask opening loosely covered.
2. Set up the syringe pump to do the measurement. Purge Optilab with THF from the 250 mL flask for at least an hour, turn off purge, and collect some baseline to make sure the signal is stable.
3. Prepare a solution of PS in a 50 mL volumetric flask at approximately 0.1 mg/mL, 0.25 mg/mL, 0.4 mg/mL, 0.6 mg/mL, 0.8 mg/mL and 1 mg/mL. Record the exact concentration. Solutions should be made by weight with an analytical balance rather than by volume. For example, put the PS into the volumetric flask, weigh it, fill the flask by THF up to the mark and weigh again. Record the exact concentration for each solution.
4. Keep all the flasks in the same place. Do not wait more than necessary. Measure immediately after making solutions.
5. Use a fresh syringe for each solution, no filter is needed.
6. Some results are shown in Graphs 1 and 2.



Graph 1: Output as a function of time of 200 kD PS in THF.



Graph 2: *dn/dc* curve of 200 kD PS in THF.