



## A NIR VCD SPECTROPLARIMETER

Recently I have been involved in the development of a low cost NIR VCD unit for my friend Sergio Abbate of University of Brescia (Italy).

Sergio has an old J-500A (Jasco Co.) equipped with the IF-500II PC interface, so the new hardware had to be compatible with the existing one, particularly with the IF-500II interface:

Our assembly includes the following components:

### *Commercial:*

- Ebert grating monochromator (Optometrics USA Inc.). 74 mm focal length, f/3.9 aperture, equipped with 830 l/mm grating blazed at 1.2  $\mu\text{m}$  and with 300  $\mu\text{m}$  wide entrance and exit slits (giving a bandpass of about 4.5 nm)
- 20W tungsten halogen light source and related power supply (Optometrics USA Inc.)
- 10 mm aperture Glan -Laser calcite linear polarizer (Casix Inc.)
- 2 mm active diameter InGaAs room temperature diode detector (Electro-Optical Systems Inc.)
- electronics from a J-500A (Jasco Co.), namely DC and lock-in amplifier and stepping motor drive
- photoelastic modulator (PEM) and its drive from same J-500A

### *Locally arranged:*

- sampling optics using a couple of lenses (one to collimate beam from monochromator output through the polarizer, the PEM and the sample, one to focus beam onto the small surface of the detector)
- simple FET preamplifier
- the original stepping motor of the monochromator was replaced with a new one matching the J-500A electronics

In this mode it's possible to control fully the data acquisition through the IF-500II keeping in mind that number of steps per nm is exactly 1/10 than in the J-500. With the components used the wavelength range of the apparatus is 800 – 1700 nm (limited from both PEM and detector).

Data acquisition is a bit more complex than in normal J-500A operation, the IF-500II is single channel, so it's necessary to collect in separate runs the AC component from the lock-in (CD mode) and the DC component from the detector (DC mode), the latter at consistently higher scanning speed.

Corrected CD data (AC/DC ratio) are obtained, with post run data processing, using Spectra Manager software (Jasco Co.).

With the same software it's also possible to ratio the DC spectra of the sample with the one of the baseline in order to get the absorption spectra in transmittance scale.

System has been calibrated<sup>1</sup> using aqueous solution of 0.24 mole of NiSO<sub>4</sub> mixed with 0.36 mole of KNa-d-tartrate at 1:1 ratio in 10 mm path cell. Preliminary performance checks were performed with (R)-(+)-limonene and (S)-(-)-limonene neat solution in 10 mm cell in the 1300-1100 nm range, obtained better results (superior s/n ratio at shorter acquisition time) than what reported previously<sup>2</sup>.

Data will be presented as a poster at next ISCD 12 conference in Chamonix (Sept 24-28).

<sup>1</sup> J-730 Hardware Manual, Japan Spectroscopic Co., 1990

<sup>2</sup> Abbate S. et al., J. Am. Chem. Soc. 111 (1989), 836