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DIFFERENCE CD ACCESSORY

Some accessories for CD spectrometers were very popular in the past and have little use today, but still may have some interest.
We will talk this time of the DCD-1 *DIFFERENCE CD ACCESSORY* (this was at least the Jasco name I extract from a 1972 manual) or, probably with better English, the 6101 *CIRCULAR DICHROISM DIFFERENCE ACCESSORY* of the Cary 61 (as I can read from a 1970 brochure).
The idea behind was very simple: CD is a very powerful technique to measure small structural modifications, therefore a device able to measure relative CD intensities between two similar or differently treated samples had a large interest.
The approaches followed by Jasco and Cary were however different:

Jasco
The DCD-1 was based on a double Fresnel rhomb, rotating the polarization by 90°.
The sample cell was placed before the rhomb, while the reference one was placed after it.
Since the beam geometry in the sample compartment was nearly parallel the standard photomultiplier tube was detecting the CD difference between sample and reference.
Fine micrometer adjustments for the rhomb were provided to get a smooth baseline.

Cary
With Model 6101 fitted, beam after passing through the sample cell, instead of filling the standard photomultiplier tube, was deflected by a close to normal incidence mirror; than it was passing through the reference cell and feeding an optional PM tube. Since mirror changed 90° the plane of polarization, effect was the same as in the Jasco case.
The Cary device was somehow simpler, but it called for a second PM tube and preamplifier when instrument had to be used for difference measurements.

In both cases you had possibility to keep sample and reference at same temperature or to use different temperatures to create the CD difference signal.
Disadvantages were similar too: you measure CD difference, but optical densities of sample and reference add-up, degrading signal to noise ratio.
Today these accessory are no more in use since it's simpler to acquire two separate spectra (even and better if in exactly same cell) and subtract them by PC data processing, but operation takes twice the time and it relies on proper long term stability (which by sure improved in current units).

So the old approach may still have advantages, replicating exactly what you get in a double-beam UV-VIS spectrophotometer when you put your cells in sample and reference paths* …..; a few application may still benefit from the old approaches, but fortunately it's not so difficult to duplicate each of the set-up illustrated above.

* *Today the CD unit offered by **OLIS** has real double-beam CD capabilities (a polarizer after the monochromator generates two linearly polarized beams at 90° each-other, these pass through same PEM and separately through sample and reference cells, each path feeding an individual photomultiplier tube).*
But matching of the detectors is obviously here the main point, a drawback not present in the old approaches listed above.

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E.C.S. European Chirality Services srl via Verdi 6A 23870 Cernusco Lombardone (Lc) Italy
tel/fax (0039)-039-9284368 mob 349-6907288 e-mail ecssrl@libero.it http://digilander.libero.it/ecssrl