



ORD ACCESSORIES FOR CD SPECTROMETERS

ORD is not the popular technique it has been in the sixties, since CD practically replaced it in most of the applications, however samples with no chromophore in the accessible wavelength range still need ORD. In addition to this in several places, for example pharmaceutical industries, ORD and polarimetry are felt as the classical approach to chirality.

So while in the past CD became an accessory for many existing ORD units (manufacturers like Cary, Jasco, Fica, Bendix followed this way) today not a single ORD spectropolarimeter is available on the market and the technique is part of the *accessories*.

Most of the commercial accessories are based on the Prof. Shindo paper¹ with:

- addition of a polarizer (usually a Rochon prism) in front of the photomultiplier
- implementation of a second driving program for the piezoelectric modulator drive to optimize the second-order Bessel function

-addition of a second lock-in amplifier at twice the normal frequency

If you want to know more about problems behind and possibility to detect simultaneously CD and ORD (an easy job with modern J-800), pls refer to the other references^{2 3}

Basic limitation of this sort of accessory is the limited range (about 1° maximum rotation) and the basic accuracy, which can be somehow compensated by software using reference sucrose spectra.

The alternative approach is available only from Jasco, it's called ORDM or whatever and has been made available for J-700 and more recent models.

This accessory is a real built in polarimetric section, designed as a second independent optical path with its own photomultiplier tube and conventionally rotating analyzer to find out optical-null.

The PEM is used here only as a way to modulate the light; this function is performed on normal polarimeters by a Faraday cell or by mechanical oscillation of the polarizer.

The optical-null approach has a built-in higher accuracy and allows to deal with very strong signals too. With ORDM accessories the unit is actually converted into a real, conventional ORD spectropolarimeter as a Jasco J-20 or a Cary 60 of the past.

The drawback is the cost and the slow response, since linked to the mechanical rotating speed of the analyzer.

Both types of accessories have therefore benefits, choice is basically related to actual application. If your interest is mainly in spectra collection and comparison the Shindo approach is the natural choice, if quantitative analysis is the main target the optical null version should be preferred.

We should also mention here (since this information seems not to be written anywhere) that with any of these accessories the spectrometer acquires the capability to perform also linear dichroism measurements (removing the analyzer in the first approach and using the CD path at twice observation frequency in the second case).

Field retrofit is possible, but a warning is necessary: pls check with a multimeter the driving voltage of the PEM for ORD mode since units originally shipped without the accessory may have casual settings in this mode potentially dangerous for the PEM

¹ Shindo Y., Hayakawa H., Sudani M. *Appl.Spectrosc.* 43 (1989) 1471

² Shindo Y., Ohmi Y. *Rev.Sci.Instrum.* 56 (1985) 2237

³ Shindo Y., Mizuno K., Sudani M, Hayakawa H., Ohmi Y, Sakayanagi N., Takeuchi N., *Rev.Sci.Instrum.* 60 (1989) 3633