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CPL (CIRCULARLY POLARIZED LUMINESCENCE) SPECTROSCOPY

CPL is the emission analogue of electronic circular dichroism (CD) and has so far been measured with home made equipments. Technique, while restricted to molecules which contain a luminescent chromophore with a suitable quantum yield, is highly complementary to conventional CD.
Several good reviews are available[1234].
Sample is irradiated with monochromatic light (usually unpolarized, but linear and circular polarization would give alternative possibilities); emitted light is collected at 180° (to minimize artifacts) or at 90° and pass through a piezoelastic modulator (PEM), a linear polarizer, a longpass filter and feeds an emission monochromator with its own photomultiplier tube.
The DC component of the output is proportional to the total luminescence
$I = I_L + I_R$
while the AC component is the CPL itself
$\Delta I = I_L - I_R$
so the dual detection can be performed by conventional CD photometry (DC and lock-in amplifier) or using dedicated photon-counting electronics[5].

Recently Jasco introduced a new dedicated unit (CPL-200) for the application. The design itself uses conventional, 180° detection, following the original early approach[6]. The excitation part includes a normal J-810 equipped with unpolarizing dispersive prisms, and no PEM modulator. Exciting beam is focused on a cell (it's possible to use Peltier or cryostatic cell holders) and collection (after the PEM, a linear film polarizer and a lens system) is performed by another J-810 monochromator ……
The assy is obviously very large (and expensive), but the double monochromator excitation (and somehow also the double monochromator emission) has a lot of benefits in stray-light rejection.
While you can easily get more information from your local Jasco office/representative, we feel that the approach has potential limits:
- cost is very high
- lack of flexibility, since normal CD operation is not possible
- choice of double prism emission monochromator may be not the more efficient when dealing with emission in the VIS or NIR range
- missing facility of excitation with other sources (lamps or lasers, unpolarized or linearly/circularly polarized)

From a certain point of view it'd be more logical to approach the problem in two other ways:
- as an accessory (a major one, complex and expensive, but still an accessory) for a standard CD unit, so keeping regular CD capabilities
- as a dedicated CPL detection unit, but with freedom to select the excitation path and its geometry, as well as with different options in the emission detector part

The third way is to recycle existing old CD units, making use of several components, in order to arrange an "home made" unit.
At this stage, considering also the costs behind, we decided to follow the third way together with friends in Italy.
We plan to set up in several months a system dedicated for a specific application, but with the aim to build-up a valuable experience for more general purpose applications.

Suggestions would be wellcome!

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