



MCD (MAGNETIC CIRCULAR DICHROISM) WITH PERMANENT OR ELECTRO MAGNETS

The parallel (or nearly so) beam output of the Jasco CD spectropolarimeters allows to use a wide selection of magnets, matter may be more complex with other manufacturer units, pls consult them directly. In the Jasco catalog you find different alternatives, namely:

Permanent magnets

PM-409 with 4KG field with cell holder for rectangular cells up to 10 mm path, this fits the standard small sample compartment of J-810 and equivalent models would fit J-710 and J-715

PM-410 with 7KG field and same type of cell holder, this requires J-810 (or J-710/715) equipped with large sample compartment

Alternatives:

some research groups are involved in the design of their own permanent magnets: a very good example is the Dept of Chemistry of the University of Copenhagen, if interested you may eventually try to contact prof Sven E.

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Electromagnets:

MCD-411 with +/- 8KG, pole gap 20mm, with cell holder for rectangular cells up to 10 mm path

MCD-412 with +/- 10KG, pole gap 15mm “ “

MCD-413 with +/- 12.5 KG, pole gap 20mm, “ “

MCD-414 with +/- 15 KG, pole gap 15mm, “ “

All these electromagnets are:

-very heavy (a lifting device is necessary to remove and refit them smoothly)

-water cooled

-with separate power supply

-requiring large sample compartment with dedicated cover

-compatible with:

CRYS-415 cryostat for solid, down to -180°C

CRYL-416 cryostat for liquid (cell path 5mm) down to -150°C

It's therefore a recommended good practice to keep these magnets permanently fitted into the main unit and to arrange an extra sample compartment in series to hold the other types of sampling devices required (for example Peltier devices); this will marginally degrade overall performances.

This extension is however not commercially available from Jasco and must be arranged locally (ECS may help if necessary).

Alternatives:

There are many suppliers able to manufacture suitable electromagnets with properly drilled pole caps.

Recent experiences indicate possibility to save a substantial amount of money in this mode (even in this case ECS may help); these magnets are typically fitted after the standard sample compartment. Here too a choice is to keep them permanently fitted, loosing marginally s/n performance.

Signal intensity for paramagnetic molecules is related to temperature (increasing when going toward low temperatures) this is reason why low temperature devices are often combined with magnets. Additionally the signal intensity is obviously related to field strength.

Both these factors may call for the use of superconductive magnets, which feature both higher field and operating temperature close to liquid Helium. But this approach calls for a far larger investment and requires additional cautions, as we will see in a next Report.

References:

the few references listed below may give a better idea of the technique^{1 2}

¹ Ball D.W. *Spectroscopy* Vol 6, No 1 (1991), 18

² Hatano M. *Jasco Application Note* No 5 (Oct 1975)