Introducing the New Standard Sample Holder (QD P/N 8000-001)

Standard sample holders, i.e. straws, (QD part number: AGC2-BOX) have long been a preferred sample holder for magnetometry due to their uniformity, low magnetic background, and general versatility. While they first found utility in the original MPMS product line, they have seen continued use in the latest generation MPMS3 as well. They can also be used as sample holders for PPMS options, e.g. the VSM (large bore coil set only) and the ACMS-II, where an electrically insulating sample holder is a necessity.

In form and function the new standard sample holders (QD part number: 8000-001) are virtually identical to those provided in the past, with the added benefit of improved straightness and general uniformity. This brief note describes the similarities and differences between the two, as well as some example background measurements.

Similarities to Previous Holders

The new standard sample holders (8000-001) are:

- Compatible with the currently offered straw adapters (4084-815 and 4500-614).
- Functional over the same temperature range.
- Compatible with the currently offered gelatin (AGC1; see Figure 1), and polycarbonate (AGC3) capsules.

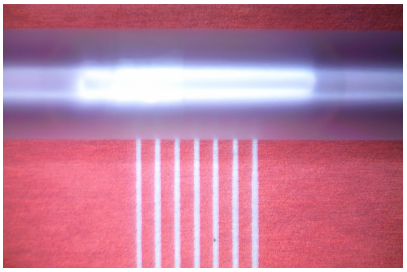

Figure 1: *Gelatin capsule within new standard sample holder.*

- Compatible with the 4 mm x 4 mm thin film sample mounting method. This technique is useful when measuring such samples with the applied field perpendicular to the film plane, as shown in Figure 2.

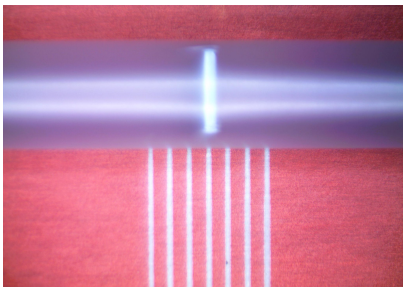

Figure 2: *4 mm x 4 mm thin film sample on a 0.5 mm thick Si substrate held in place without adhesives and oriented such that the applied field is perpendicular to the film plane.*

Differences from Previous Holders

A few minor discrepancies will be apparent, including:

- They are now wrapped in clear plastic instead of paper.
- They are much straighter. This helps decrease the chances of rubbing inside of the sample chamber during a measurement and is the most significant benefit to the new standard sample holders.
- They will fit a bit tighter on the straw adapters. This means they require a bit more care when mating them to the straw adapter, but also results in a more confident and lasting fit.
- They are more opaque, or frosted, in appearance, see Figure 3. This variation is purely cosmetic, and does not impact their utility from a magnetometry standpoint.

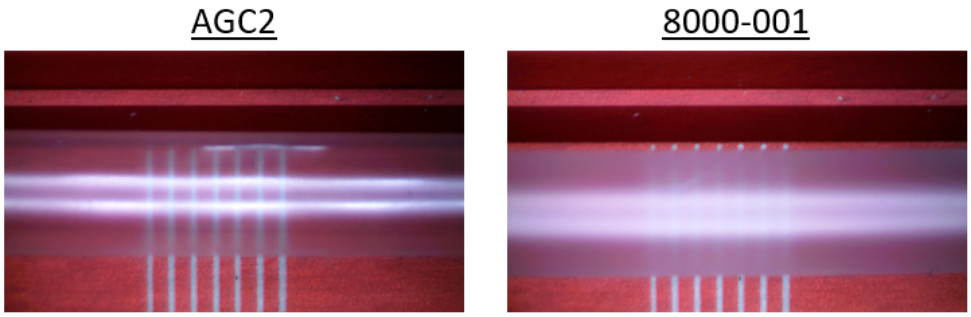

Figure 3: *The new standard sample holders are more opaque and have a somewhat frosted appearance as compared to the old drinking straws.*

Background Measurements

Of paramount importance for their suitability as a sample holder for magnetometry, is the background response, both as a function of magnetic field and temperature. Figure 4(a) shows the moment versus field response at 300 K for both the old (black squares) and new standard sample holders (red circles). Both exhibit a weak diamagnetic response, with the new standard sample holders exhibiting a slightly smaller diamagnetic susceptibility. Figure 4(b) shows the moment versus temperature response at 7

tesla for a new standard sample holder. A small paramagnetic upturn is found at low temperatures and no magnetic signature indicating oxygen contamination is found. These measurements were conducted using the MPMS3 using the SQUID-VSM detection mode and centering manually at the 66 mm mark. Note, there are no strict specifications related to the background signal, and therefore these results should be regarded as typical.

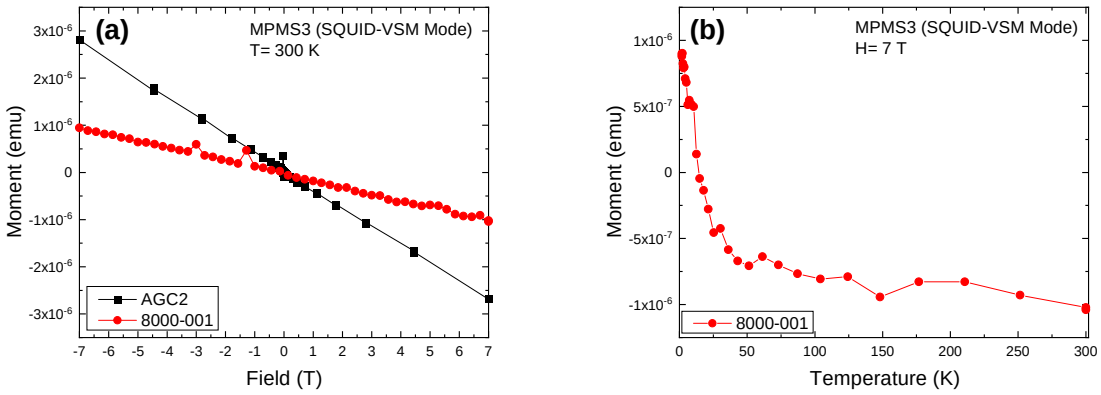

Figure 4: *(a) Moment as a function of applied field at 300 K comparing AGC2 (black squares) and the new standard sample holder (red circles). Both show a weak diamagnetic response, with the new standard sample holder exhibiting a slightly smaller diamagnetic susceptibility. (b) Moment as a function of temperature at 7 tesla of the new standard sample holder. A small paramagnetic upturn is observed at the low temperatures and no oxygen signature is apparent. Note, there is no specification related to the background signal and these measurements should be regarded only as typical.*