DMA TRAINING
Updated 12/20/2016

Summary of training procedure
Training for the DMA typically takes about an hour. Training involves learning the startup and shutdown procedures for the instrument, installation of different geometries into the instrument, and an overview of the software. We don't typically help trainees optimize test procedures, but during training, you and I can set up a procedure template that should be a good starting point for you to begin testing your materials.

Gaining access to the DMA
Please note that users are required to reserve instrument time on the DMA using the Calcium calendar/ reservation system. The link to the calendar is below. 24 hour notice for instrument reservations is preferred.
https://neon.materials.cmu.edu/calendars/Calcium40.pl
Once you are trained on the DMA, I will send your Andrew ID to Bill Pingatore, who will add you to the Calcium system and give you access to the reservation calendar.

Also note that the DMA is located in room DH A305, the Materials Science undergraduate teaching lab. This room requires you to have swipe access; to inquire about gaining swipe access, you'll need to contact Jeanna Pekarcik in the MSE office. The office is located on the third floor of Wean Hall (room 3309).

Three rules of using the DMA
There are only three main rules to follow on using the DMA. You probably will not accidentally hurt the DMA by adjusting procedure parameters within the TRIOS software – the instrument is good at recognizing its limits (within the software) and alerting you if you enter parameters that fall outside of its capabilities – so adjust away. BUT, if you do not abide by the following three rules, you *will* break or damage the instrument.

1. ALWAYS turn on the compressed air (yellow lever on the wall to the left of the instrument) BEFORE turning on the DMA.
2. DO NOT lower the upper geometry head into the lower geometry piece, or the ground, or into anything else. Do not hit or jam the geometries with anything. You will damage the geometry *and* the inner parts of the DMA.
    a. For that matter, keep an eye on the force the instrument is measuring/ experiencing during your experiments. The DMA has a 50 N force cell – it should not experience anything higher than this.
    b. Also, be gentle with the geometries in general. The bottom geometries (and where they interface with the instrument) are especially sensitive and should not be scratched.
3. DO NOT heat your sample within the DMA to (or past) its melting point.

Re: Bringing a sample to training
In my experience, I have found that it's most helpful to new users of the DMA if I can conduct the training with the trainee's own materials. I would much prefer to wait until you have at least a small sample of your material. That way, you will get the most out of the training session, and the training can be the most efficient and informative for you.
Also good to bring: calipers and tweezers. These are not supplied for you at the instrument.

Re: Sample preparation
The DMA is designed to test materials in bulk. It is not designed to characterize materials that are very thin (like wafers < 1 mm thick, or films that are not free-standing).
For films (testing in tension): if you can cast your material fairly thin in a glass dish, we can use a razor blade to peel up a free-standing film, and then cut the film into a rectangle of the right dimensions. You can measure the film's final/ exact dimensions with calipers. You can use other casting methods as well.
For pellets (testing in compression or shear): your sample **must be at least 1 mm thick**, but thicker than that is better. Any thinner and it is too easy to damage the DMA. For the diameter, around 4mm is an appropriate size (and circular is good).

For specifics on ideal dimensions of samples for DMA, the ASTM (American Society for Testing and Materials) website is an excellent resource.
ASTM: http://www.astm.org/

Re: Limitations and capabilities of the instrument
For information on the capabilities and limitations of the instrument, you may consult the specs listed on TA instruments's website or the instrument user manual. The DMA is an RSA-G2.
http://www.tainstruments.com/rsa-g2/#ffs-tabbed-22

Also, TA instruments has excellent customer service. Their service support hotline can help you with questions you have about the instrument and how to optimize your test parameters for your sample (for free).
http://www.tainstruments.com/support/service/service-support-hotline/

Re: Temperature sweeps on the DMA
Liquid nitrogen is required for any experiment that will be performed under controlled temperature conditions (even if the experiment is above room temperature). The DMA uses nitrogen as a carrier gas to help maintain/ regulate sample temperature; without LN2 your sample's temperature will not be well-regulated. A tank of LN2 is provided for use with the DMA, but it is a good idea to check that the tank is relatively full (pressure gauge is well above 0) before reserving calendar time for your experiment. If the LN2 tank appears empty or low, you may request that a new tank be ordered. Please direct these requests to Bill Pingatore.

Before performing any experiments at elevated temperatures on the DMA, please make sure that you know the melting point of your material. **Do not run your sample on the DMA at or above its melting point!**