



CHEMICAL HYGIENE PLAN | Dr. S. Passchier | Mallory Hall 259 – Sedimentology Laboratory

In case of a medical or fire emergency call Campus Police at 973-655-5222

Departmental main office in ML252 with secretary Mrs. Patti Flatley at 973-655-4448

1. RESPONSIBILITIES

1.1 Laboratory supervisor (Dr. Passchier)

At Montclair State University, faculty with laboratory instruments are assigned the same teaching, mentoring, scholarly, and service requirements as other faculty (Faculty Handbook, Provost's Office, 2012), and often carry out significant administrative duties and service directed by the university and external funding agencies. Therefore, like other faculty, the sedimentology lab supervisor (Dr. Passchier) is available only during office hours or by appointment. Dr. Passchier will take care of instrument preparation and maintenance, and training of lab users and instrument operators according to standard operating procedures, following the information provided by the manufacturer of the laser instrument, and CSAM laser safety guidelines (see section 2). She is, however, not responsible for supervising students in the lab during the sample preparation or the operation of the instruments after training has been received, and should only be involved in trouble shooting instrument problems. The lab supervision of students and research guidance is the responsibility of the Principle Investigator.

1.2 Faculty advisor or principal investigator (PI)

The faculty advisor or principle investigator (PI) of the project is responsible for the day to day guidance of staff and students in the lab (CSAM Lab Safety Manual, 2012). The PI is responsible for all aspects of the research conducted within the project, including lab safety training, lab access, student compliance with safety regulations, chemical waste pickup, ordering of necessary lab supplies (including PPE and waste collection containers), cleaning of communal lab spaces and supplies, funding, quality control, and data management. The faculty PI will determine whether the student advisee is ready to work alone in

the lab. Hence, PIs are expected to be engaged in understanding the laboratory methods by attending instrument specific lab instructions and to make an effort to contribute to the costs of the lab analyses. The Sedimentology Lab does not receive funds or human resources from the department or the college for instrument use or sample preparation.

1.3 Student laboratory research assistant

Students should be under guidance of a staff or faculty advisor, either through enrollment in a class, an independent study or a student volunteer contract. Students will be required to watch the 24 minute video "Experimenting with Danger" and will attend other Environmental Health and Safety meetings relevant to the department's activities in the communal labs and as required by "Right to Know". The student will follow safety procedures outlined in the CSAM lab safety manual and report unsafe conditions in the shared lab spaces immediately to the faculty advisor, the department chair Dr. Brachfeld, or departmental staff (ML 252). Instrument specific training with Dr. Passchier is required for use of the laser particle sizer (see section 2). Students are required to schedule lab time in the Sedimentology Lab and on the laser particle sizer by consulting with both Dr. Passchier and the responsible faculty PI, stating the required sample preparation, number of samples to be analyzed, and the project title and PI.

1.4 Department of Earth and Environmental Studies

Following general safety guidelines at similar universities: "The chair has primary responsibility for the safe management of laboratories in the department, including compliance with all applicable regulatory requirements, and shall require that all laboratories in her charge be safely managed. She may delegate to other departmental faculty or staff members the authority to oversee these activities. As the safety and well being of students, faculty, and staff come above all other considerations, the chair shall ensure that no experiment that subjects personnel to excessive risk of injury is permitted" (University of Louisville, <https://louisville.edu/dehs/ohs/labchemsafe/manual/chap1.html>, 2013) and that access to labs, instruments, and chemical storage is restricted to individuals working with approved standard operating procedures. Allowing unsupervised labwork by students is at the discretion of the chair and he or she may request faculty or staff presence in the lab upon evaluation of laboratory procedures.

1.5 Human Resources

The Human Resources department takes care of the student injury report system. Student lab workers might be covered by worker's compensation in case of injury, depending on full-time or part-time status. Work Related Injury Reporting Procedures are outlined here:

<http://www.montclair.edu/media/montclairedu/humanresources/policiesandprocedures/WRIP.pdf>

Injury should be reported within 24 hours to the Benefits Office Ph. 973 655-7396.

2. INSTRUMENT SAFETY AND STANDARD OPERATING PROCEDURES

2.1 Laser Instrument Safety

The sedimentology laboratory at Montclair State University is equipped with a Malvern Mastersizer 2000 laser particle sizer. The optical unit of the Mastersizer is designated as a Class 1 laser product. The CSAM laser safety manual recommends the following for Class 1 laser products

<http://www.montclair.edu/media/montclairedu/csam/students/CSAM_laser_safety_manual.pdf >:

“Class 1 (Eye Safe Lasers)

Class 1 lasers are lasers that cannot cause injury from viewing the accessible laser radiation for the maximum possible duration inherent in the design. Very few lasers are Class 1, however, many laser systems can be made into Class 1 systems by totally enclosing the laser beam and interlocking the enclosure. Class 1 lasers do not require a LUR (Laser Use Registration).”

Maintaining the Class 1 designation of the laser optical unit requires that users adhere to the guidelines for the operation of the optical unit as described in the appropriate sections of the Health and Safety booklet (Malvern Instruments Ltd, 1998-2001). The booklet also includes a section on the sample dispersal unit (Hydro MU). Most importantly:

- operators are trained by a supervisor (Dr. Passchier) who is responsible for the management/safety of the system and its operation

- supervisors or operators are not allowed to remove the covers of the optical unit - only Malvern personnel can remove the covers
- never place fingers in the sample beaker when rotar or sonicator is on, as rotars might cut fingers and sonication damages red blood cells

All potential users are required to read the appropriate sections of the Health and Safety booklet (Malvern Instruments Ltd, 1998-2001).

The samples fed into the instrument should be suspended in distilled or filtered water. The instrument has a size range of 0.02-2000 μm , which is the size range of most natural sediments. If you would like to analyze sediments with a gravel component, samples need to be sieved over 2 mm, and that fraction could be weighed. The < 2mm fraction can be measured in the laser particle sizer. Sample preparation methods depend on the purpose of your analyses.

2.2 Standard Operating Procedures (SOP)

SAMPLE PRETREATMENT FOR SEDIMENTS WITH NEGLIGIBLE BIOGENIC SILICA

- Place approx. 100 mg of sample in a 250-400 ml glass beaker.
- Label the beaker with the sample I.D.
- Add 10 ml of 30% H_2O_2 and shake or mix. Let stand overnight if necessary.
- Transfer the beaker to a hot plate in a fume hood and heat until reaction occurs.
- Add ca. 25 ml of distilled or filtered water.
- Rinse the walls of the beaker to return spattered material to solution.
- When reaction ceases add 5 ml of 10% HCl and boil.
- Rinse the walls of the beaker to return spattered material to solution and add water to 50 ml mark.
- Let boil for 10-15 min until reaction stops completely.
- Take beaker off the hotplate and cool.
- Water level should be less than 50 ml, if not: let boil until more water has evaporated.

- Take beaker out of the fume hood.
- Rinse the walls of the beaker lightly.
- With a gloved finger wipe material sticking to the walls of the beaker and flush it down.
- Transfer the entire contents of the beaker to a 50 ml polypropylene centrifuge tube.
- Label the centrifuge tube with the sample I.D.
- Add distilled or filtered water to 50 ml mark and screw the cap tightly on the tube.
- Place the tube in a centrifuge and rotate at 1500 rpm for 30 minutes.
- Take the tube out and carefully decant part of the supernatant. Siphon the remaining supernatant off with a pipet.
- Refill the tube with distilled or filtered water to 50 ml mark, shake the tube to disperse sediment, and place it back in the centrifuge; rotate at 1500 rpm for another 30 min.
- Take the tube out and again remove supernatant.

SAMPLE PRETREATMENT FOR MARINE SEDIMENTS WITH SMALL AMOUNTS OF BIOGENIC SILICA

- Place approx. 100 mg of sample in a 250-400 ml glass beaker.
- Label the beaker with the sample I.D.
- Add 10 ml of 30% H₂O₂ and shake or mix.
- Transfer the beaker to a hot plate in a fume hood and heat until reaction occurs.
- Add ca. 25 ml of distilled or filtered water.
- Rinse the walls of the beaker to return spattered material to solution.
- When reaction ceases add 5 ml of 10% HCl and boil.
- Rinse the walls of the beaker to return spattered material to solution and add water to 50 ml mark.
- Let boil for 10-15 min until reaction stops completely.
- Take beaker off the hotplate and cool.

- Water level should be less than 50 ml, if not: let boil until more water has evaporated.
- Take beaker out of the fume hood.
- Rinse the walls of the beaker lightly.
- With a gloved finger wipe material sticking to the beaker and flush it down.
- Transfer the entire contents of the beaker to a 50 ml polypropylene centrifuge tube.
- Label the centrifuge tube with the sample I.D.
- Add distilled or filtered water to 50 ml mark and screw the cap tightly on the tube.
- Place the tube in a centrifuge and rotate at 1500 rpm for 30 minutes.
- Take the tube out and carefully decant part of the supernatant. Siphon the remaining supernatant off with a pipet.
- Refill the tube with distilled or filtered water to 50 ml mark, shake the tube to disperse sediment, and place it back in the centrifuge; rotate at 1500 rpm for another 30 min.
- Take the tube out and again remove supernatant.
- Add distilled or filtered water to 20 ml mark.
- Add 1 N NaOH solution to 25 ml mark.
- Shake each tube to mix dispersed sediment and solution.
- Place tubes in water bath at 85-90 degrees for 1 hour.
- Take tubes out of water bath and cool.
- Add distilled or filtered water to 50 ml mark.
- Place the tubes in a centrifuge and rotate at 1500 rpm for 30 minutes.
- Take the tube out and remove supernatant.
- Transfer contents back to glass beaker used previously.
- Add a small scoop of sodium pyrophosphate to disperse sediment.
- Add water to 50 ml mark and bring to a boil.
- When starting to boil take the beaker off the heat and cool.

APPROVED STANDARD OPERATION PROCEDURE (SOP) FOR THE MALVERN MASTERSIZER 2000

BEFORE YOU START

1. Turn on the computer and click the MSU student tab, but DO NOT activate the Mastersizer program yet.
2. Turn the main instrument on with the switch on the right side of the long unit that carries the lasers. After turning the instrument on a blue light illuminates at the top. Let the laser instrument warm up for 15 minutes. In the mean time disperse your samples and set up the sample dispersion unit.
3. Prepare your samples for measurement in the particle sizer. (See sample preparation procedures above for details.) In case your sample has a significant fine fraction you may have to heat 50 ml of water plus sample with a small scoop of Sodium pyrophosphate to disperse the sediment. You do this in the fume hood wearing appropriate protection (goggles, gloves, coat). After you are done let the sample cool down in the fume hood.
4. Turn the sample dispersion unit on with the switch at the back, near the top of the unit. If the green button at the front is illuminated, turn it off. Slowly raise the unit to take away the beaker. Replace the beaker with a new, clean beaker with Millipore water. Lower the unit so that the probe with rotor sinks back into the beaker.
5. Turn on the rotor by pressing ON in the upper "pump speed" panel of the dispersion unit. Water should now circulate through the tubes and into the measuring cell. Let it circulate for a while to clean the system, until your samples have cooled to room temperature and you are ready to start a measurement.

START A MEASUREMENT

6. Replace the beaker with clean water and on the computer activate the Mastersizer program by logging on. Make sure the rotor in the beaker is ON! (Hit ON on the "pump speed" panel if it is not on).
7. Create a new measurement file in the <Measurement Files> folder on the desktop. Click <File> at the left upper corner in the toolbar and click <New> or <Open> an existing file.

8. Click <Measure> in the upper toolbar and <Start SOP>. SOP stands for Standard Operating Protocol. Choose an appropriate standard operating protocol (“marine_seds” for sediments with a significant clay fraction or “sediments” for silt and sand sized sediments). Ask Dr. Passchier if you need to measure a sample with a non-siliclastic composition.

8. Follow the directions in the yellow bar at the bottom of the measurement window. After you hit <Start> the system will align and you will hear some noises: that’s OK. The instrument will measure the background of the water first. The background should not exceed 50 units on the vertical scale bar for any of the channels.

9. After the background measurements a “Documentation” window will pop up. Fill in the appropriate information about your samples and click OK.

10. After the measurement is complete follow the directions in the yellow bar at the bottom of the screen and discard the sample through a sediment trap (milk jug in the sink). Flush the instrument with clean water between samples. For coarse samples (sand): flush 3 times and check for large particles at the bottom of the beaker.

EXPORT THE DATA

11. Click <Edit> in the toolbar at the top. Scroll down to <User sizes> and click. Set the user sizes of your preference and click <Save size> and then OK. Save the *.siz file in the folder on the desktop named “Measurement files”.

12. In the Records tab select the rows of data that you would like to export. In the upper toolbar click <File> and then <Export Data>.

Choose a Format (for Excel both will work)

Check the box “Export data to this File”

Browse to find a location for the file (desktop folder named “Measurement files”)

Choose a new filename (include date and initials)

Click “Overwrite File” or “Append to File”