SELFRAG SAMPLE FRAGMENTATION PROCEDURE

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Selfrag offers an alternative means for extracting geochronologically useful minerals from rock samples. As this process separates minerals having different electrical properties along their grain boundaries, it is capable of isolating minerals without the breakage or damage that may arise during the conventional crushing and milling process. Therefore the method is also highly suitable for other work purposes, that require mineral separation, like morphological studies of surfaces.

The Selfrag device offers two major possibilities of fragmentation.
One possibility allows for grain size separation during fragmentation which however requires a much more time consuming cleaning and more complicated sample container assembling and disassembling procedure. It takes thus longer and is more complicated. It also leads to a stronger and thus more expensive degradation and consumption of parts like sieves, etc…and therefore will be charged at higher costs.

Alternatively the container without the mesh sieve, in an especially available set-up can be preferably used. This set up will collect all the material at the bottom of the sample container and do not separate the different size fractions. This is preferred when the sample can be sieved after the fragmentation and especially for small sample sizes. The entire procedure becomes much simplified in this procedure, less time consuming and the results are the same. The sample can be than sieved after drying and the minerals can be picked.

The below description deals with the mesh sieve set up but the fragmentation is exactly the same when using the container without sieve.

To begin sample fragmentation, turn on the Selfrag instrument using the power switch (right hand side of instrument) and open the N_2 gas supply valve to the instrument. On the control panel, log in to the instrument and allow it to complete its self-test procedure.

Ensure the polypropylene container, metal sleeve, O-rings and all other components are thoroughly washed and rinsed beforehand. After cleaning with detergents, all parts may be ultrasoned within a large ultrasonic bath if available (not yet).

Select a mesh size appropriate for the sample grain size; 300 µm mesh size is a good general-purpose option. Stainless steel mesh is preferred for most geochronology samples, as nylon mesh will be rapidly eroded during extensive fragmentation. Steel mesh last much longer but not for ever! Fit the two O-rings to the pre-cleaned polypropylene container.

As the fragmentation process generates significant vibration that can cause nuts to loosen, ensure that all nuts during assembly are tightened on bolts to the tension specified by the manufacturer using a torque wrench.

Assemble the mesh into the mesh holder and pass the electrode bolt through the mesh assembly.

Assemble the polypropylene container into the metal sleeve with the O-rings intact, ensuring that the 3 retaining bolts are tightened to the correct tightness using a torque wrench. Pass the electrode bolt with mesh holder through the polypropylene container and attach it to the metal sleeve using the nut provided. Tighten to the correct tightness using a torque wrench. Fit the spacer bolt to the protruding end of the electrode and tighten to the correct tension using a torque wrench.

Place the assembly in the assembly jig. Fit the pre-cleaned black rubber mineral collection receptacle in its metal holder, attach both to the base of the metal polypropylene assembly (within the jig) and, ensuring it is in the correct orientation, tighten the 3 retaining nuts to the correct tension.

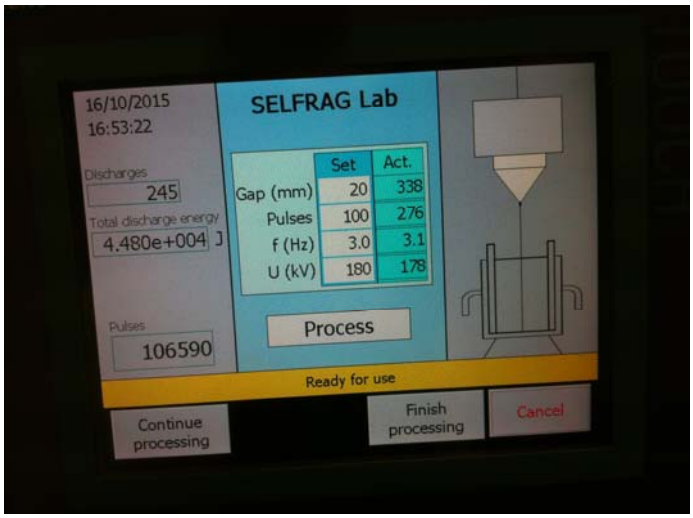
Remove the assembly from the jig and, after rechecking all parts are correctly assembled, fill the assembly partially with water. Then squeeze and pump the rubber sample receptacle at the base of the assembly to remove all air bubbles. Open the Selfrag doors and place the assembly in the Selfrag, ensuring that the assembly fits firmly into the fitting mounts in the green base of the device.

Place the pre-cleaned Calibration Spacer (see above) into the sample assembly and further fill the sample assembly with water to the top of the bevel in the polypropylene container. Close the instrument doors.

The instrument is now ready for calibration of the electrode gap. On the instrument panel, run the "Calibration of the Electrode Gap" routine. On completion, open the instrument doors and remove the Calibration Spacer from the sample receptacle.

The instrument is now ready to fragment a geological sample.

Geological samples should be broken up into pieces of roughly fist size or preferably smaller. Place the sample rock pieces into the sample receptacle. Re-fill with water to the top of the bevel in the polypropylene container.



Close the instrument doors. Set the gap initially to 30 mm, pulses to 100, Frequency to 3.0 and kV to 180 and start the processing routine.

When the processing is complete and the alarm indicating that the doors may be opened has sounded, open the Selfrag doors, remove the assembly and decant off the excess water containing the finer sample fragments. Very muddy water will suppress the arc and the fragmentation process, so it is necessary to decant off the muddy water and replace it with clean water before recommencing the fragmentation process. Examine the sample to ensure that it has broken into smaller fragments, that the finer material is passing through the mesh and that the mesh is not clogged or damaged. Some material may be examined under a binocular microscope to monitor the fragmentation process. Replace the assembly in the Selfrag and refill the assembly with clean water to the top of the bevel in the polypropylene container.

Repeat the processing until the water in the assembly is not muddy but only cloudy. Then, repeat processing with the gap set to 20 mm and then again with the gap set to 15 or 10 mm. If the sample is fine-grained, fragmentation will be completed when most or all of the sample has passed through the mesh. If porphyritic, then larger grains and composites may not fragment but will remain in the polypropylene container. Typically, about 800 pulses will be required to completely fragment a dolerite sample.

When sufficient material has passed through the mesh and processing is completed, remove the assembly and dismantle the base, containing the rubber sample receptacle. Decant off the excess water. Rounded metal particles derived from the electrodes will also be present in the sample and should be removed using a hand magnet when processing is complete.