Risø NaI(Tl) Gamma Spectrometer

Sample Cup Casting Instruction

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READ THIS MANUAL CAREFULLY BEFORE YOU START TO CAST YOUR SAMPLE CUPS!

Contents

1 Prerequisite Tools and Facilities

- Ventilated oven for drying sample (min. 80 °C)
- Ashing oven (min. 450 °C)
- Hot plate (min. 80 °C)
- Wax melting bath (min. 80 °C)
- Disposable aluminium sample tray (min. 0.8 L)
- Wooden stick for mixing (min. 10 cm long)
- Balance (min. 1 kg capacity)
- Rubber hammer
- Insulated thermal gloves

NB: Melted wax could easily harm your fingers when you touch it or its containers, e.g. heated disposable aluminium trays. Please ware Insulated thermal gloves anytime when you need to touch them!

2 Sample Preparation

2.1 Ashing Your Sample

1. Weight a disposable aluminum tray (Tray 1), and get Tray Weight, e.g. 17.43 g.
2. Load sample in the Tray 1 and dry it in an oven at ~ 80 °C, overnight.
3. Weight dried sample, and get Dry Weight e.g. 1238.73 g.
4. Ash sample in an ashing oven of ~ 450 °C, overnight.
5. Weight ashed sample, and get After-Ashing Weight, e.g. 1224.05 g.
6. Fill all above data in an Excel sheet (see attached template XXXX_gamma cups casting SW.xlsx).
7. Calculate mineral ratio in the sample, e.g. 0.988.

2.2 Grind sample to a grain size of ~100-200 µm

2.3 Estimate sample quantity

Make an estimation on the sample quantity to be mixed in the wax according to information given in the template XXXX_gamma cups casting SW.xlsx. General rules are:

1. The final Dry Sample in the cast should be within 100-400 g. A 50 g of sample in the sample cup usually requires more than 2 days of counting to bring down uncertainty.
2. In the final cast, keep the ratio of Sample weight/Cast cup weight as close as possible to 0.2-0.7. A too high sample ratio (which means there is too much sample in the wax mix) could cause inhomogeneous mixing problem. A too low sample ratio (which means there is too less sample in the wax mix) could cause inhomogeneous distribution of sample in the cup.

3 Mixing Sample

1. Weight another disposable aluminum tray (Tray 2) with a mixing disposable wooden stick, and get Tare Weight, e.g. 10.93 g.
2. Load pre-estimated sample slowly into Tray 2, and get Sample Weight (with tare), e.g. 378.93 g.
3. Leave Tray 2 with sample on a heating plate of ~ 80 °C.
4. Add melted wax ~100 g (pre-melted at ~ 80 °C) in the first step, and mix sample with wax.
5. Add more wax and mix sample thoroughly. Here enough wax should be added, so the volume of wax-sample mixture prepared should exceed the total volume of the aluminum mould.
6. Weight final Total Weight (with tare). Be careful, it is hot!

4 Casting

1. Pour sample mix into aluminum mould gently, while keep on scrubbing the bottom of the Tray 2 and try to move as much sample as possible into the mould.
2. Continuously pour sample mix until it reaches about 5 mm to the top edge of the mould.
3. Cover the mould with aluminum lid and push it down as tightly as possible, to squeeze the rest of the sample mix out of the depleting holes on lid.
4. Let sample mix cool down for more than 2 hours.

5 Demoulding

Please refer to the illustrations below for demoulding.

1. Remove the sample/wax came out from the holes on the top of the lid (Figure 1).
2. Remove lid (Figure 2).
3. Unscrew the nut off the mould from the bottom. Remove the bottom support and turn the mould cylinder upside down (Figure 3).
4. Push the center part of the mould to squeeze the wax cup out of mould cylinder. You may need to use a rubber hammer to hammer gently (Figure 4).
5. Remove the inner support plate (Figure 5).
6. Lay the bottom support on top of the sample wax cup, and insert the nut (Figure 6).
7. Tighten the nut and it will push the sample cup off from the inner cylinder of mould.
8. Carve cup code on the top of the sample cup with a sharp pen.
9. Weight the sample cup and get Cast Cup Weight.
10. Fill all above obtained data into XXXX_gamma cups casting SW.xlsx and calculate Dry Sample in cast. This is the final sample weight contained in the cup.

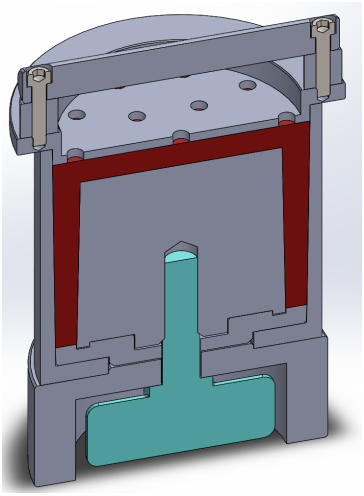

Figure 1. Remove sample from top of the lid.

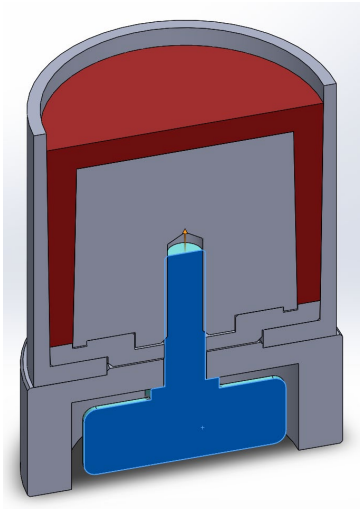

Figure 2. Remove lid.

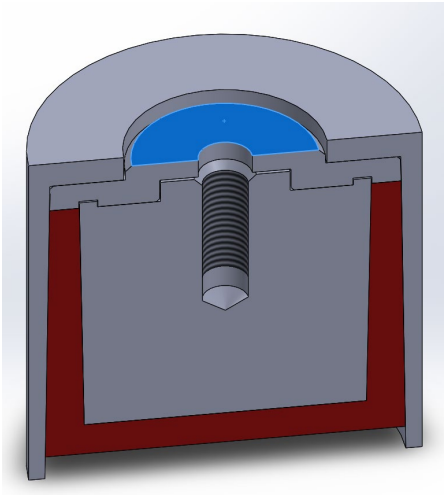

Figure 3. Turn the mould upside down.

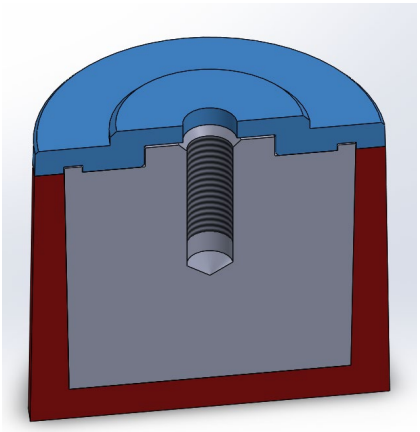

Figure 4. Push the wax cup out of mould cylinder.

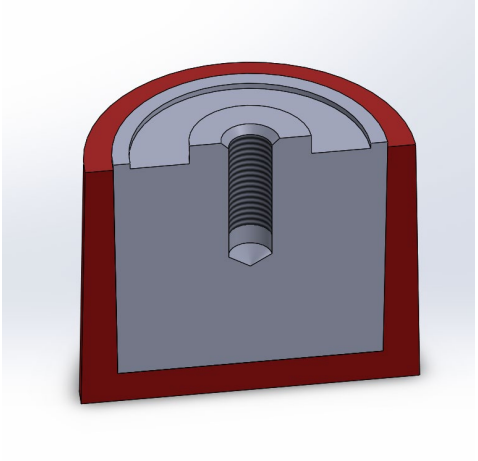

Figure 5. Remove the inner support plate.

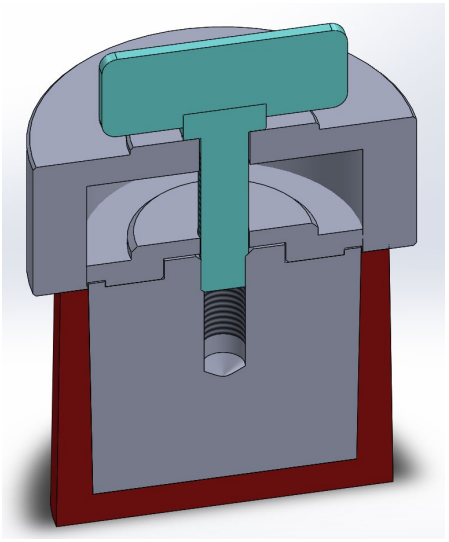

Figure 6. Configuration before pushing wax cup.