

Punch pressing of freeze-cast, lyophilized and calendered MXene aerogels

Date: 2021-11-04

Tags: Freeze-cast Calendering Aerogel 11/10/2021Synth Nanoplexus 200 2021 Punch

Created by: James Bird

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Goal : Use punch press on freeze-cast, lyophilized and calendered MXene aerogels to acquire cylindrical samples of known precise diameter

Procedure :

- Place cuboidal samples, fabricated in [\[Experiment\] Calendering of freeze-cast MXene aerogel I](#) between two sheets of greaseproof paper, cut square with each dimension ~ 3 to 5 times the largest sample dimensions.
- Choose desired punch diameter (12 mm) and install in manual punching machine (Gelon Group GN-CPM20).
- Ensure all components that can come into the contact with the sample are cleaned with IPA and allowed to dry.
- Perform punch.

Results :

Two cylindrical samples are produced, each with $\phi = 12$ mm, with details summarised in the table below:

Sample / #	Thickness (dim. // to freeze-plate) / mm	Volume / cm^3	Mass / mg	Density / g cm^{-3}
1	5	0.565	240.4	0.425
2	2.5	0.283	107.2	0.379

IMG_1701.JPEG pictures the 5 mm thick sample (left) and the 2.5 mm thickness sample (right). The method left some curvature to the underside of each sample, where Sample #1 is imaged in IMG_1801.JPEG. Such curvature is unsuitable for LFA measurements, where thermal diffusivity is calculated as a function of thickness squared. Hence, samples are calendered again, much as described in [\[Experiment\] Calendering of freeze-cast MXene aerogel I](#), although without the need to dislocate the top of the calendar press, hence improving the accuracy roller height accuracy. New sample details are provided in the table below, and an image of the re-rolled Sample #1 is shown in IMG_1802.JPEG.

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Sample / #	Thickness (dim. // to freeze-plate) / mm	Volume / cm ³	Mass / mg	Density / g cm ⁻³
1	1.3	0.147	240.4	1.637
2	0.65	0.074	107.2	1.457

Attached files

IMG_1701.JPEG

sha256: a50aef8ee1cf0bbe3bb13af0a098a002636441c91837ef843a92cf9531e28454



IMG_1801.JPEG

sha256: cd60c99e32fa4532a92ff624bc9860c7f3327df8a279eabd2aa4f061ed3398d2



IMG_1802.jpeg

sha256: 8c24dfdb1048fd77d62691bcd84d5d88b4654834e3847ea16b689fd4fe803637



Unique eLabID: 20230416-750431be1a98753e7ecf8f53888d8ee6a29e1d03

Link: <https://frankel-elab.manchester.ac.uk/experiments.php?mode=view&id=106>