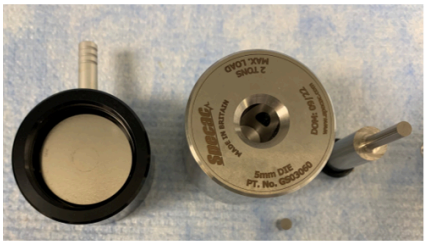
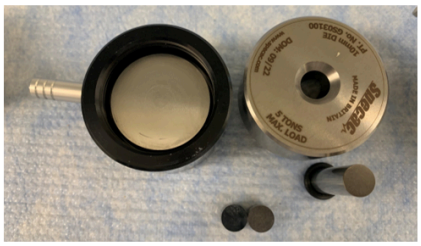
Pellet die set choice and optimal load

There are three available die sets for BioXAS Sector in which samples can be prepared from to make pellets (5mm, 10 mm and 13 mm). Each die set has a maximum load capacity (see below). The difference in choice can be decided on by (available sample mass, density of sample, compressibility of sample, how well it mixes with binder, the required amount obtained from edge step calculations).

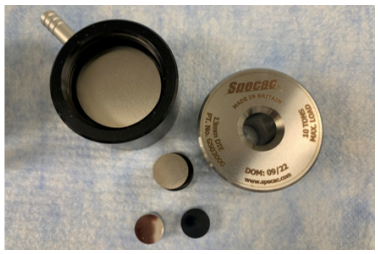
5 mm die
2 TONS



10 mm die
5 TONS



13 mm die
10 TONS



Binder Choice

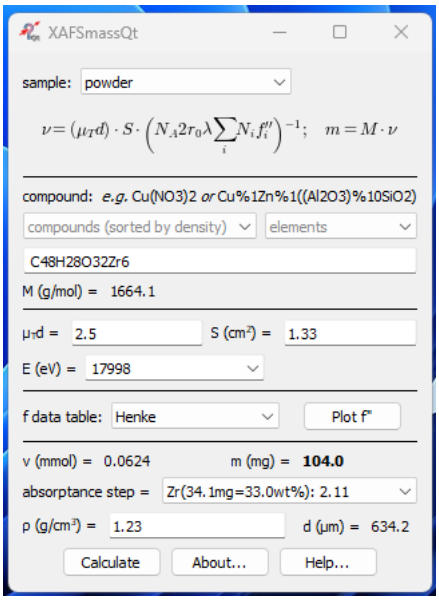
Binder	density (g/cc)	notes
C	2.26	doesn't make good pellets
BN	2.1	Ok, but sticky
PEG	~1.1	may burn if pellet is going to be heated
Cellulose	1.5	may burn if pellet is going to be heated

Edge Step Calculation for Optimal Sample Preparation

Example using ZrMOF with chemical formula of C48H28O32Zr6 (density~ 1.237g/cc) for measurements at the Zr K edge

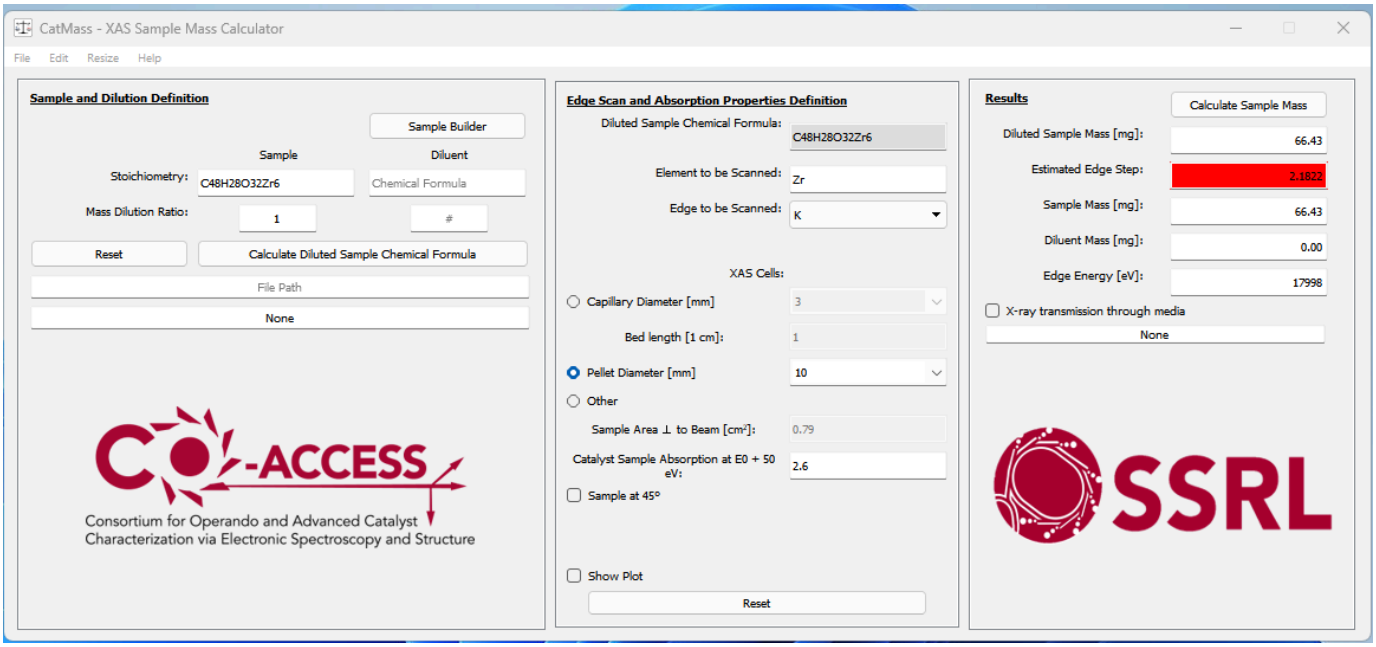
Using XAFSmass

an edge step of 2.11 will be obtained if using a pure pellet made of the sample (104mg) ; can dilute to make a total mass (diluent and sample) of 100-150 mg (10 mm die)



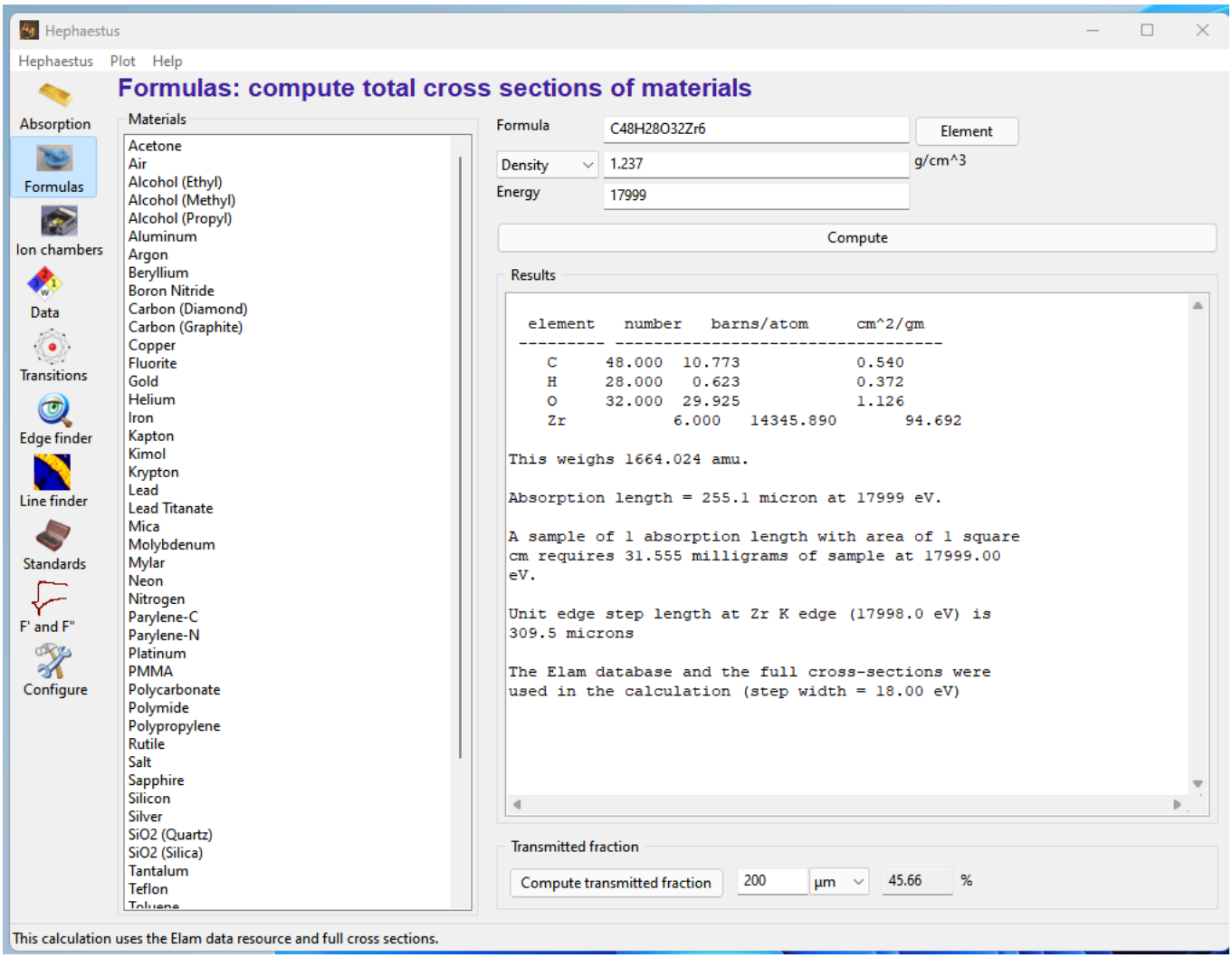
Using Catmass

an edge step of 2.1 will be obtained if using a pure pellet made of the sample (66.43 mg) ; can dilute to make a total mass (diluent and sample) of 100-150 mg (10 mm die)

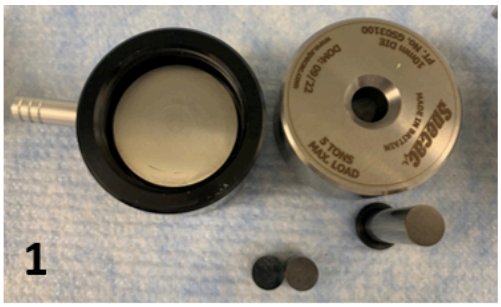


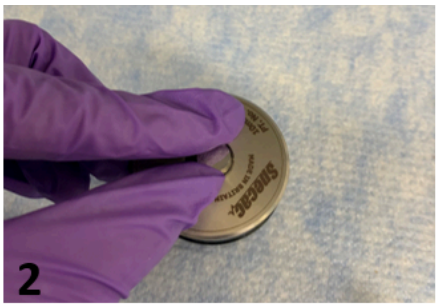
Using Hephaestus

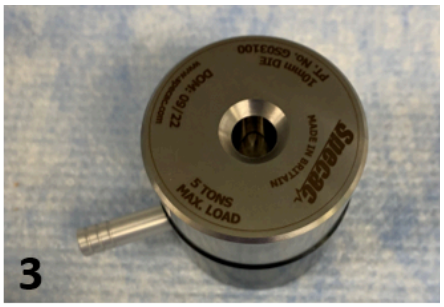
an edge step of 1.2 will be obtained if using a pure pellet made of the sample (31 mg) ; can dilute to make a total mass (diluent and sample) of 100-150 mg (10 mm die)



Assembly of die set







Preparing a Pellet

After a specific powder sample (make sure finely ground using mortar and pestle) is weighed, it can be transferred into the die seen , as seen below. After waiting at least 5 minutes at the designated pressure, release the black knob and retract die. Open die set carefully and gently push pellet onto a weighing paper. Use Kapton to sandwich the pellet onto it to create a fee-standing pellet.