

M3D2:Purify active material

4/21/2016

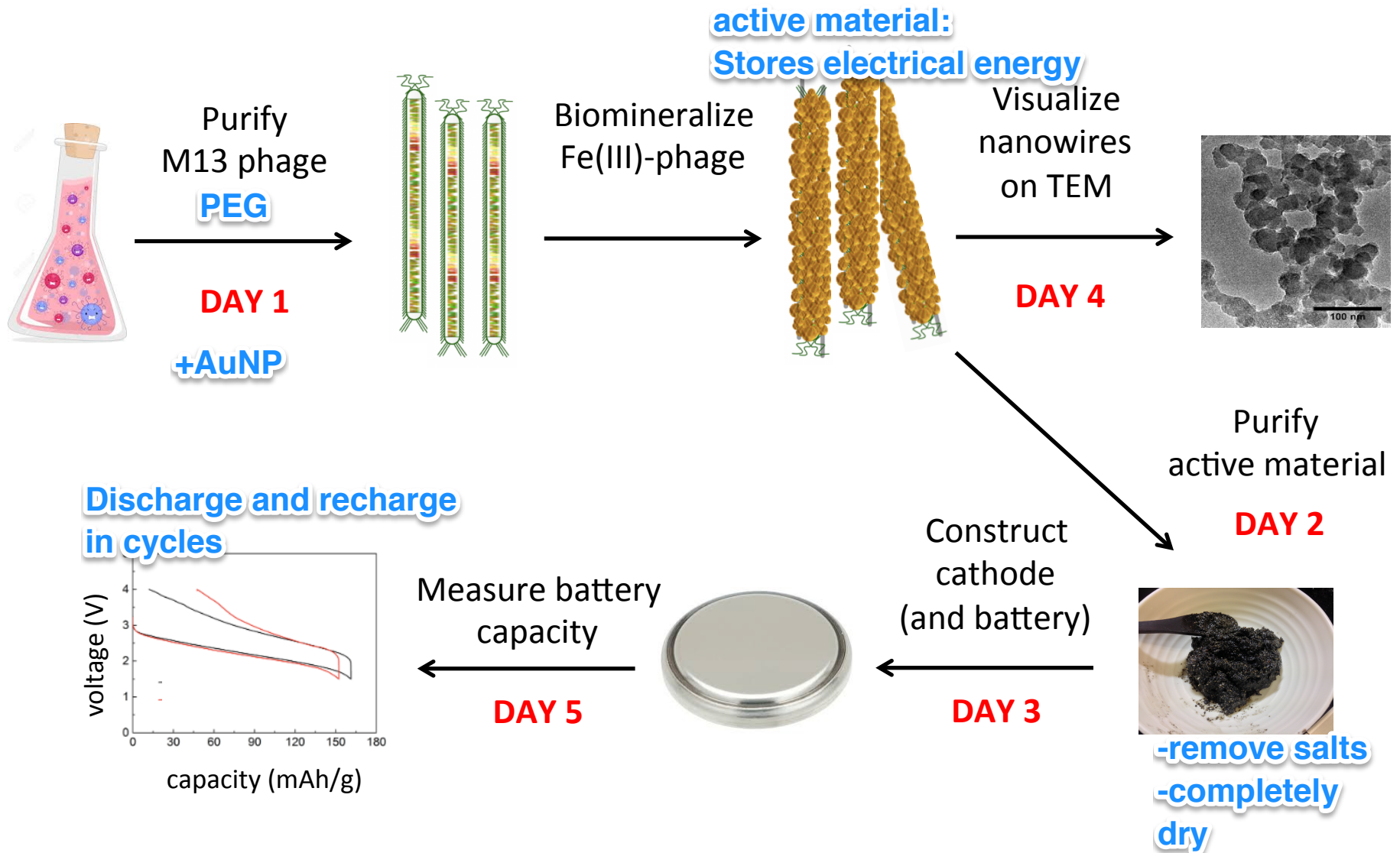
1. BE Communication lab workshop: Research Proposals!
2. Prelab
3. Demo of FePO₄-phage reaction
4. Collect and wash active material: AuNP-Fe(III)-phage nanowires
5. Prepare TEM samples
6. Prepare active material for 80°C vacuum oven

Congratulations! You made it through Mod2



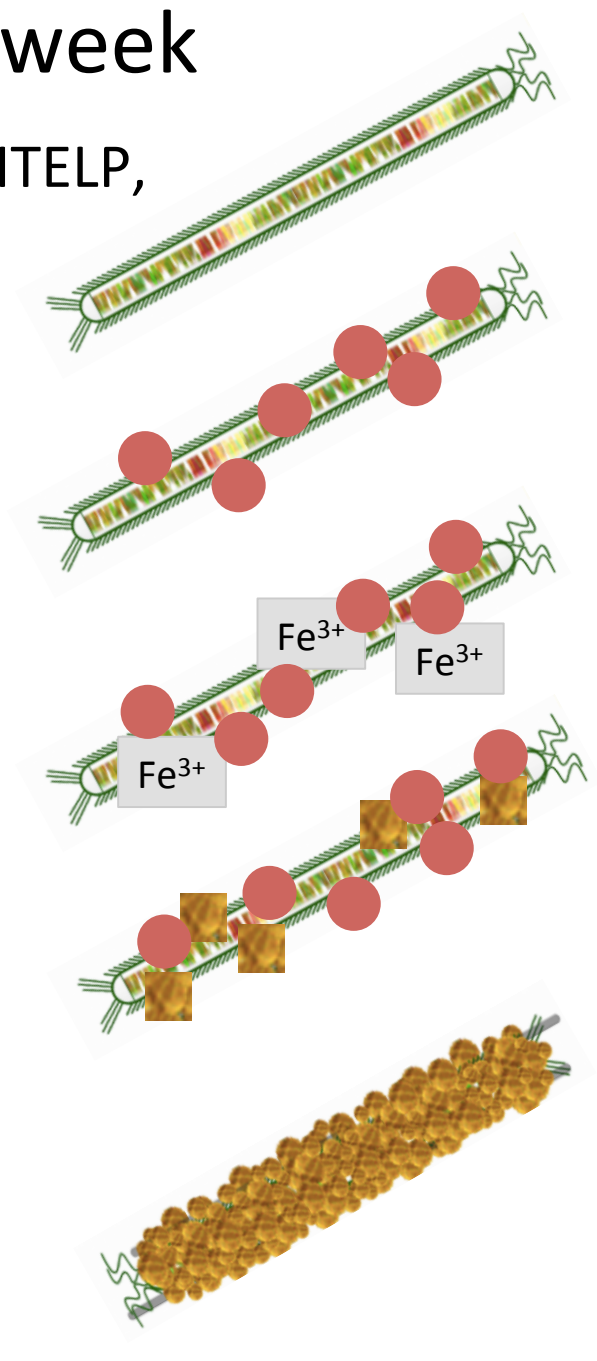
- ✓ Research report
 - returned on **May 3rd**
- ✓ And also journal club and blog!
- M3 research proposal
 - HW due M3D3 in pairs: refine your topic and approach, doesn't have to be your final proposal, **get feedback during downtime(s)**
- Quiz on M3D3!

Module 3: biomaterials engineering



Biomining happened this week

- P8 coat protein modified to include DSPHTELP, negative charged peptide
- Gold nanoparticles (Au-NP) incubated with phage for 5 days
- Electrostatic affinity between p8 and Fe^{3+} from $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$
 - 90% efficiency!
 - Fe^{3+} back into solution if wait more than 12 h
- PO_4^{3-} from NaPO_4 precipitates Fe(III)
iron phosphate
- nucleation / accumulation / mineralization ensues
 - Amorphous: a-FePO_4 (not a crystal structure)
better for conductivity

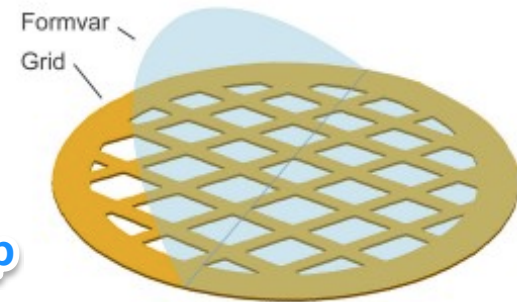


Set aside AuNP-Fe(III)-phage for TEM analysis

- The AuNP-Fe(III)-phage active material is in its purest form today
 - Next week we will add materials necessary for cathode construction

- Formvar coated Cu-grid

- copper-orange side **bottom**
- ✓ silver/black side where droplet deposited **top**



➤ Practice handling it with tweezers!

side view

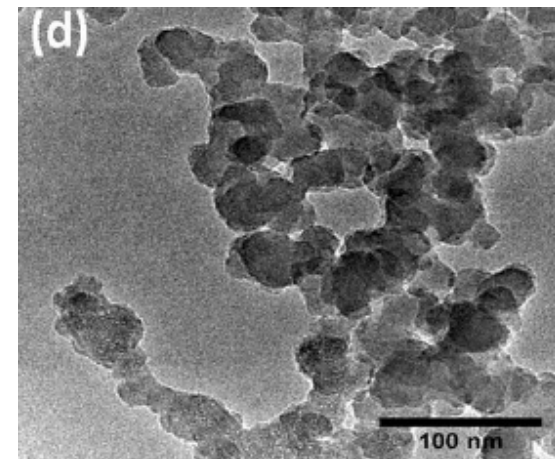
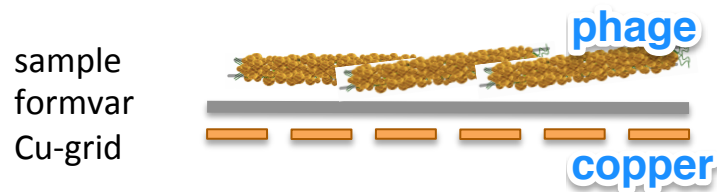
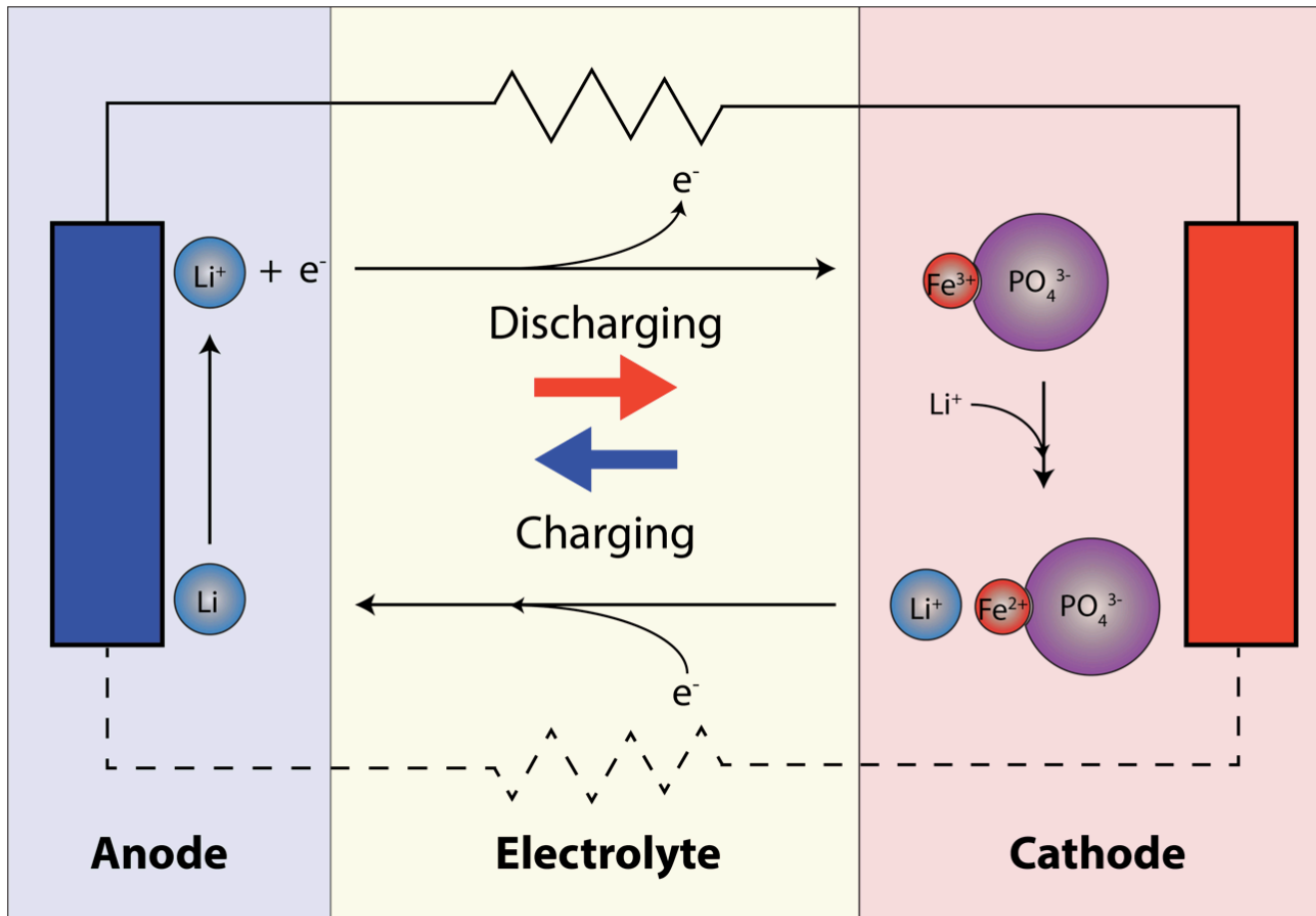


Diagram of M3 battery

M13 phage **scaffold**

AuNP **electrical conductor**

Fe(III) NaPO₄ **ion storage**



In lab today...

1. Demo of FePO₄-phage reaction
2. Collect and wash active material (lots of long spins!)
3. Practice then prepare TEM samples
4. Prepare active material for 80°C vacuum oven

write observation out in notebook

- During the downtime you should discuss and choose a topic for M3D3 homework (and potentially beyond!) submitted together
- Remember class time 4/28 Prof. Belcher would like to hear elevator pitches from as many of you as possible.

NO LAB 4/28!