M3D2:Purify active material

11/16/2017

1. BE Communication lab workshop: Research Proposals!
2. Prelab discussion
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

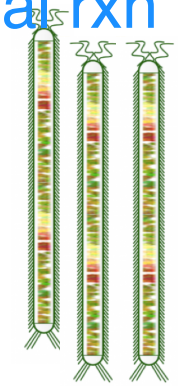
Module 3: biomaterials engineering

How do nanoparticle material and size affect battery capacity?

active material: in cathode, part of charge/discharge cycles electrochemical rxn

Purify
M13 phage
Add AuNP

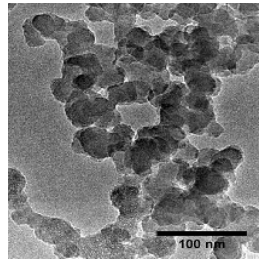
DAY 1



Biomineralize
Fe(III)-
phage-AuNP

Visualize
nanowires
on TEM

DAY 4



Purify
active material

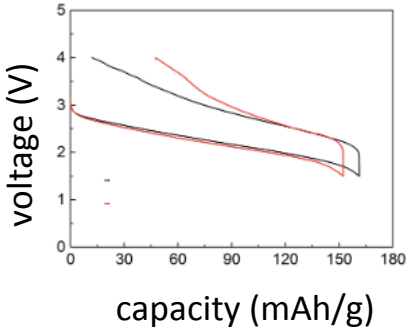
DAY 2

Construct
cathode
(and battery)

DAY 3

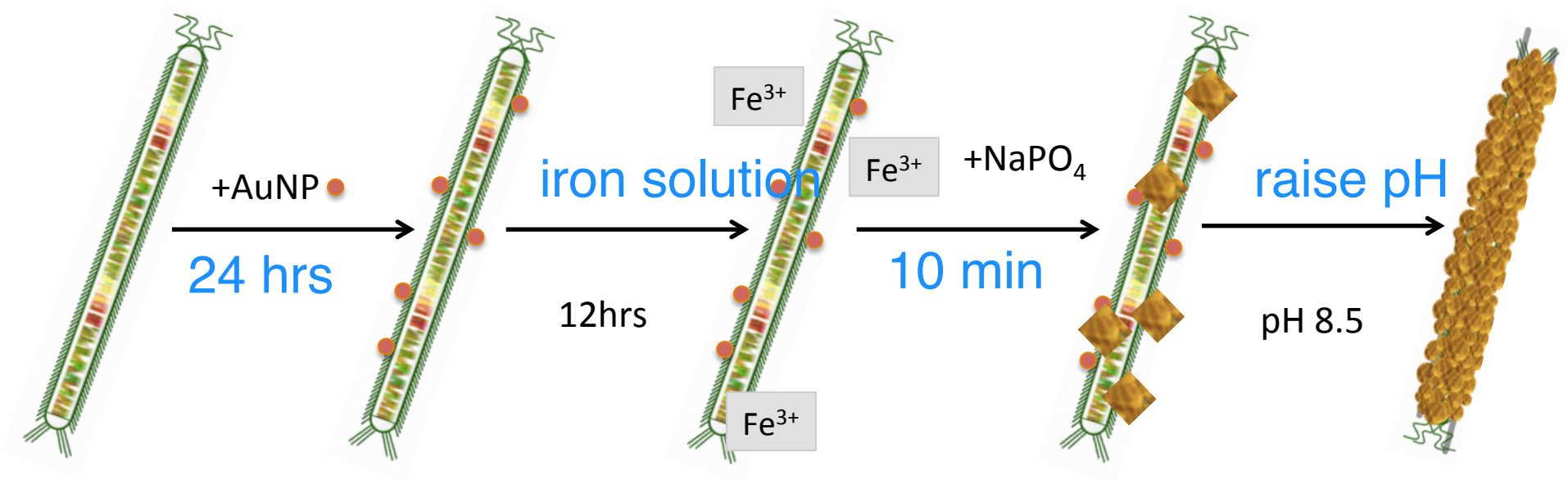
Measure battery
capacity

DAY 5



Phage Biomineralized with Iron and NPs

p8 coat protein modified to include DSPHTELP, negative charged peptide



sodium phosphate precipitates the iron

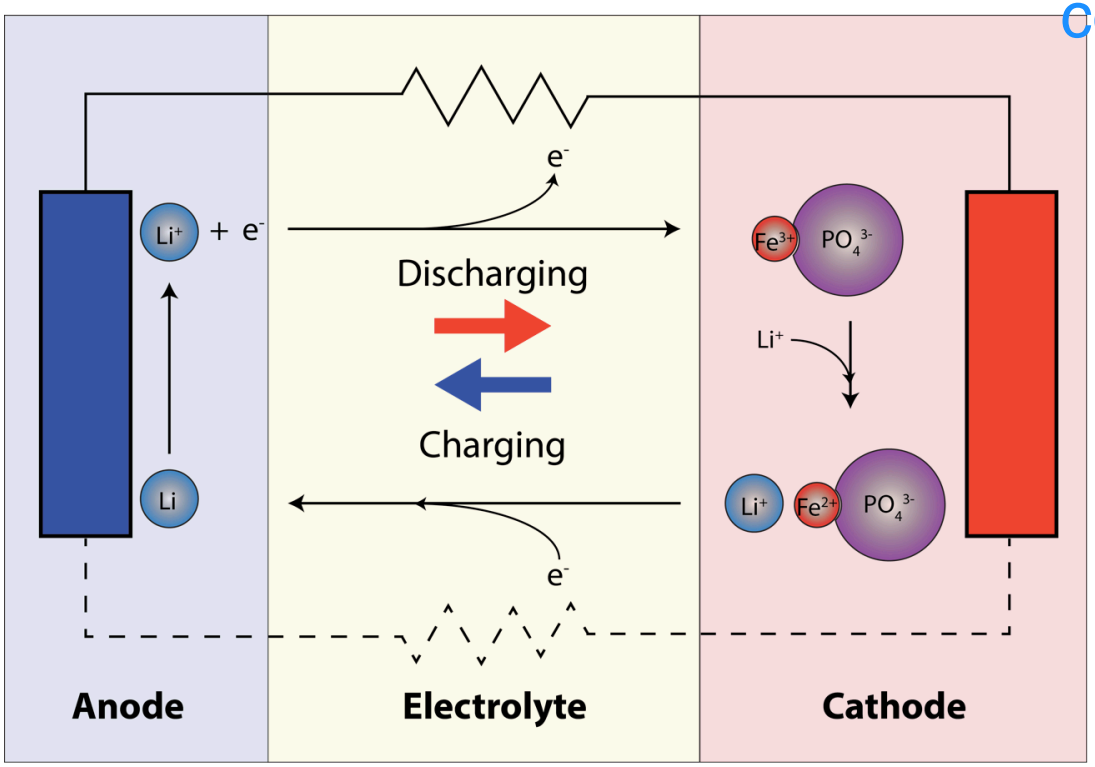
amorphous iron facilitates ion insertion into cathode material

Diagram of Mod3 battery

M13 phage: scaffold electrica

Au or NiNP: conducto

Fe(III) PO4: ionic conductor

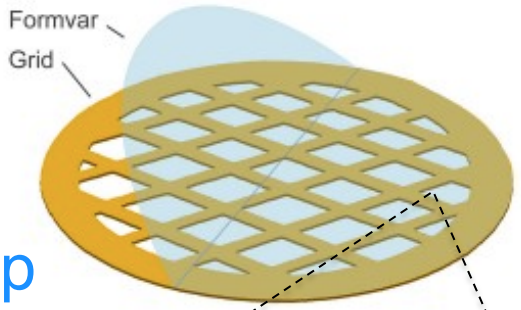


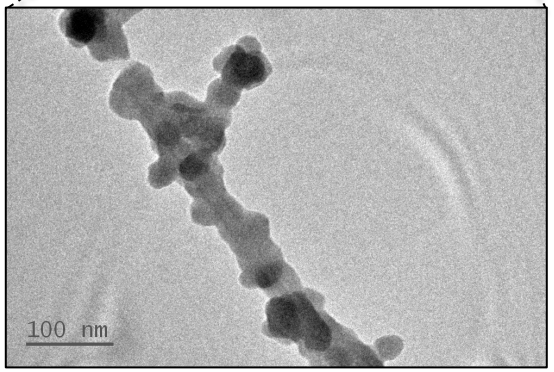
Set aside Fe(III)-phage-AuNP for TEM inspection

- The Fe(III)-phage-AuNP active material is in its purest form
  - no impurities, binder, etc.

- Formvar coated Cu-grid
  - copper-orange side
  - ✓ silver/black side where droplet deposited

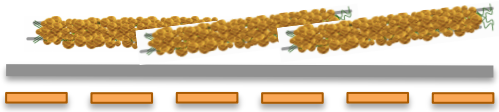
  ➢ Practice handling it with tweezers





side view

sample
formvar
Cu-grid



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

- During the downtime you should discuss and choose a topic for M3D3 homework (and potentially beyond!) submitted as a pair/team
- Remember class time 11/21 Prof. Belcher would like to hear elevator pitches from all groups.