

# M3D2:Purify active material

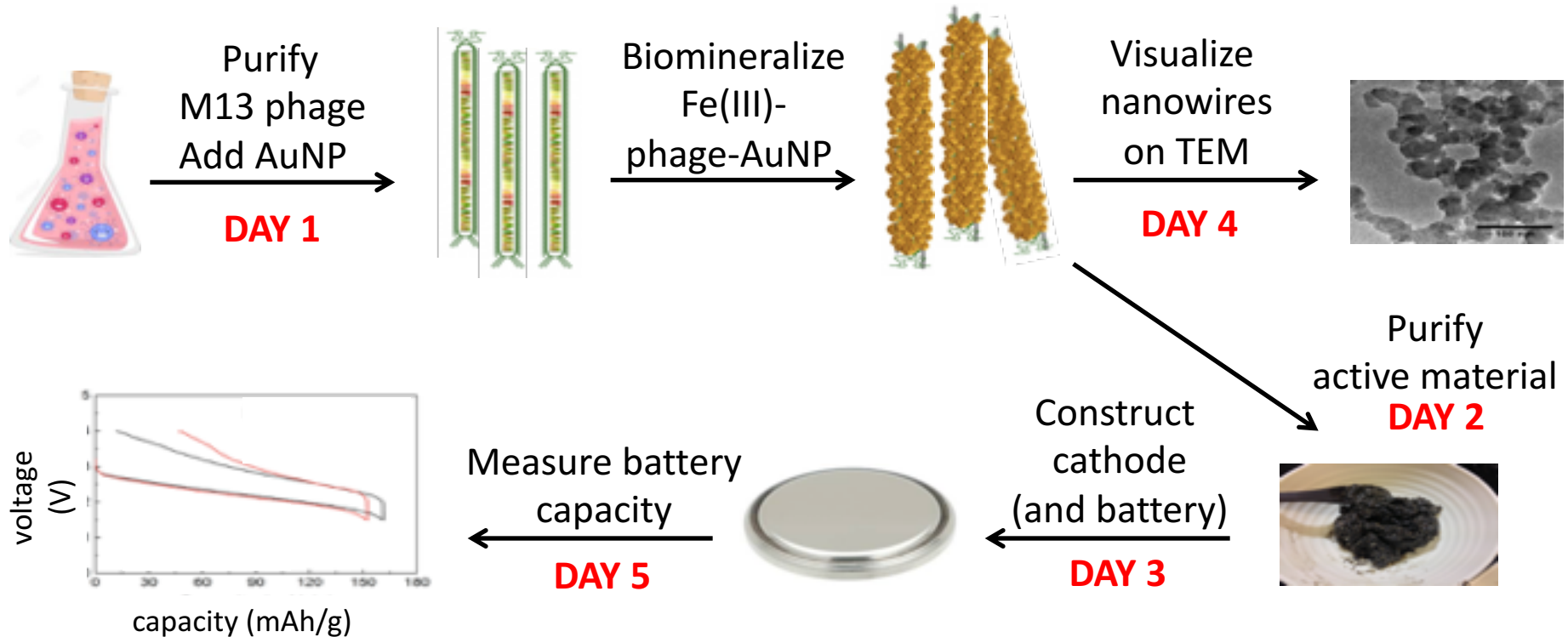
1. BE Communication lab workshop: Research Proposals!
2. Prelab discussion
3. Demo of  $\text{FePO}_4$ -phage reaction
4. Collect and wash active material: AuNP-Fe(III)-phage nanowires
5. Prepare TEM samples
6. Prepare active material for 80°C vacuum oven

## Announcements

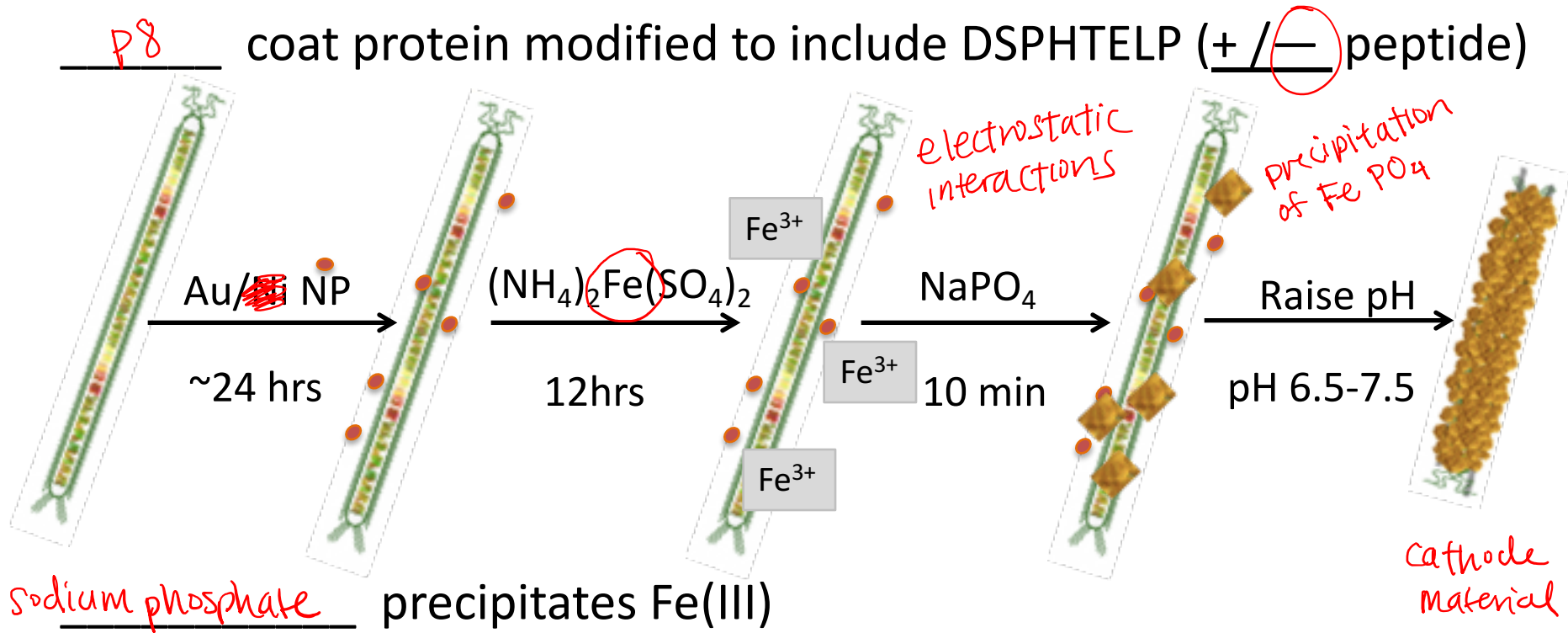
- Pitch proposals in lecture on 11/20 to Prof. Belcher
- Quiz on M3D3 11/27

# Module 3: biomaterials engineering

## Do gold nanoparticles improve battery capacity?



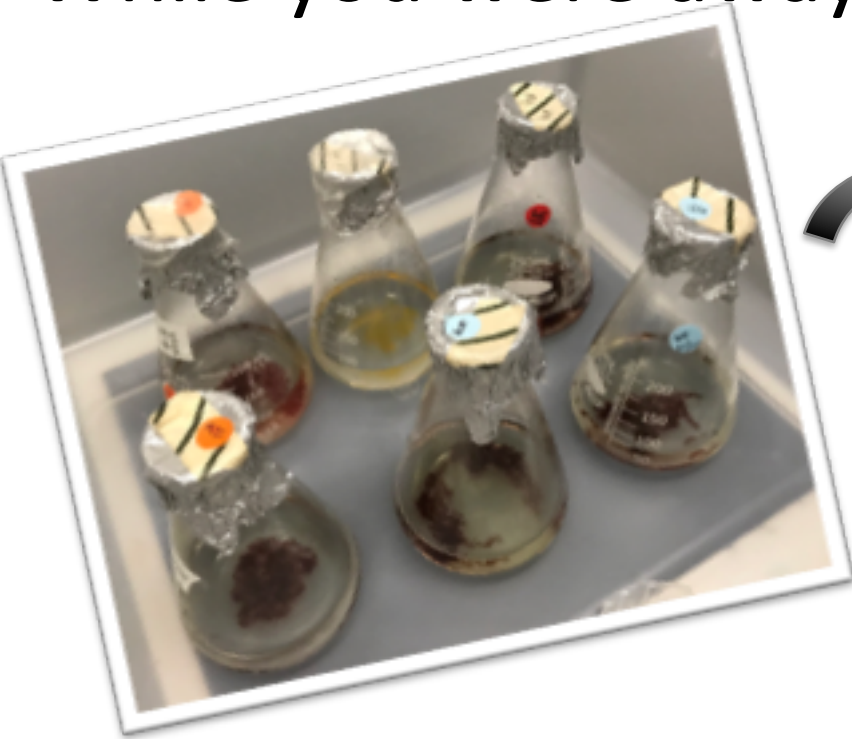
# Phage Biomined with Iron and NPs



amorphous iron facilitates ion insertion into cathode material

# While you were away...

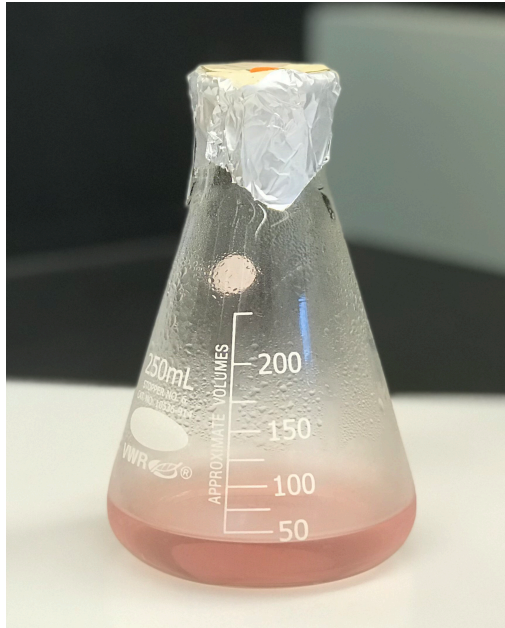
Last night:  $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)$   
This morning:  $\text{Na}_2\text{HPO}_4$  &  
pH to 6.5-7.5



# You will receive pictures of your flasks today

phage + AuNP

1) \_\_\_\_\_



12 hrs after adding

2) Iron Sulfate



After adding  $\text{Na}_2\text{PO}_4$ ,

3) adjust pH 6.5-7.5

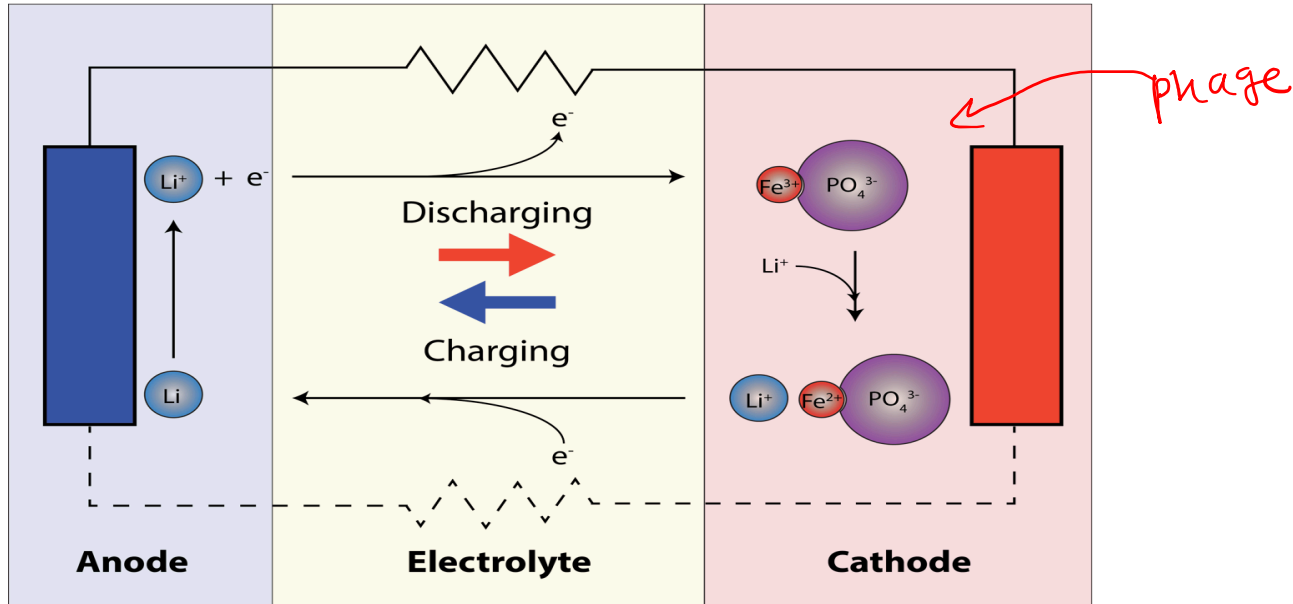


# Diagram of Mod3 battery

M13 phage: scaffold

AuNP (& SuperP): electrical conductor

Fe(III) PO<sub>4</sub>: ionic conductor



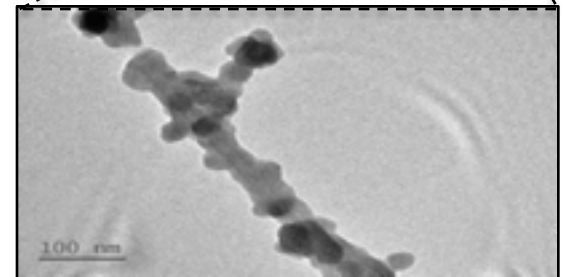
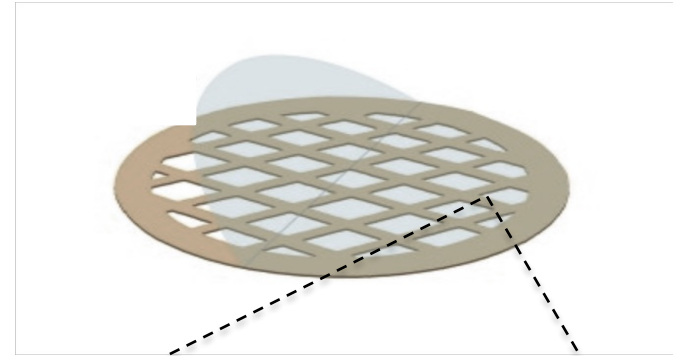
# Set aside Fe(III)-phage-NP for TEM inspection

- The Fe(III)-phage-NP active material is in its purest form
  - No impurities, binder, etc.
- Cu-grid, carbon mesh
  - Copper is the orange side
  - ✓ Silver/black side where droplet deposited

➤ Practice handling it with tweezers

side view

Sample  
Carbon mesh  
Cu-grid





# In lab today...

1. Do Part 3 First (Collect active material)
  2. Demo of  $\text{FePO}_4$ -phage reaction during spin
  3. Practice then prepare TEM samples
  4. Prepare active material for 80°C vacuum oven
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- During the downtime you should discuss and choose a topic for M3D3 homework (and potentially beyond!) submitted as a pair/team
  - Quiz on M3D3
  - **Class time Tues. 11/20 Prof. Belcher would like to hear elevator pitches from all groups.**
  - No Lab next week! Work on research proposals!