Journal Article Discussion:

*Please read the following article before class*

Moreau, L. M.; Ha, D-H.; Zhang, H.; Hovden, R.; Muller, D. A.; Robinson, R. D. “Defining Crystalline/Amorphous Phases of Nanoparticles through X-ray Absorption Spectroscopy and X-ray Diffraction: The Case of Nickel Phosphide,” *Chem. Mater.*  **2013**, 25, 2394-2403. DOI: 10.1021/cm303490y

To prepare for class discussion, work on the following questions to turn in at the beginning of class (you will likely want to have notes or an extra copy to participate in the discussion).

1. Review from general chemistry: explain the difference in your own words between amorphous and crystalline solids.
2. Ni2P has been reported as a catalyst for hydrotreating in fuels.
   1. Before this catalyst what catalysts were used?
   2. Is Ni2P better? If so, how?
3. How does crystalline nature of a material relate to broadness (full width at half-maximum) of a peak in an XRD pattern?
4. Explain, in your own words, two characterization techniques mentioned in this paper that we have not covered in class.
5. What methods do the authors of the paper use to elucidate the distinctions between amorphous and crystalline phases?
   1. What limitation does each method have?
   2. Give an example of how using more than one method confirmed their results.
   3. Using the d-spacing for the (111) planes given in Figure 3 (2.21 Å), calculate the observed peak position (2θ) in XRD.