Materials 2 Questions set 3
Small scale structure of Materials, and Sketching

1. When we look at a cut surface of wood we can see the small scale structure of the material (you probably know this from 'everyday knowledge'). Make an annotated sketch to describe another example of small scale structure that you can observe in materials (using you eyes), include a scale bar in your answer.

2. Make simple annotated sketches to show the difference between amorphous and crystalline materials. Give an example of a material that has an amorphous structure and of a material that has a crystalline structure.

3. State approximate values for density, strength and Young's modulus for magnesium (Mg) alloys, state your reference source. Comment on the values, given that some small scale structures in materials are essentially fixed, while others we can modify.

4. Make annotated sketches of
(a) bcc unit cell, and give an example of a material that packs in this manner
(b) fcc unit cell, and give an example of a material that packs in this manner
(c) a polymer chain
(d) a perfect crystalline lattice
(e) a dislocation in a crystalline material
(f) a grain boundary in a crystalline material

5. Define the term phase.

6. In engineering we often assume materials are isotropic and homogeneous. From your knowledge and understanding of materials so far (from the course and from everyday knowledge), what examples can you find of when these are good assumptions to make, and when they are not. Use annotated sketches to illustrate your answers.

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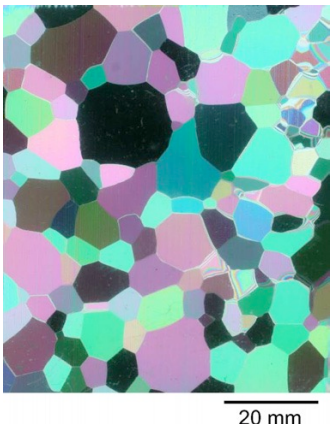
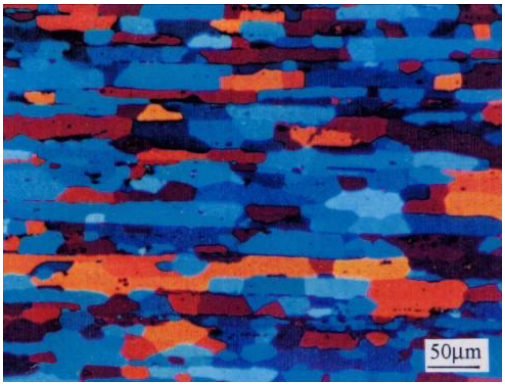
7. Make representative labelled sketches of the following images of microstructures.
A comment on the usefulness of sketching: when you sketch you tend to notice more features in an image than by looking at it quickly or taking a photograph. Sketches, with labels or annotations, are excellent ways to convey information in materials and engineering.

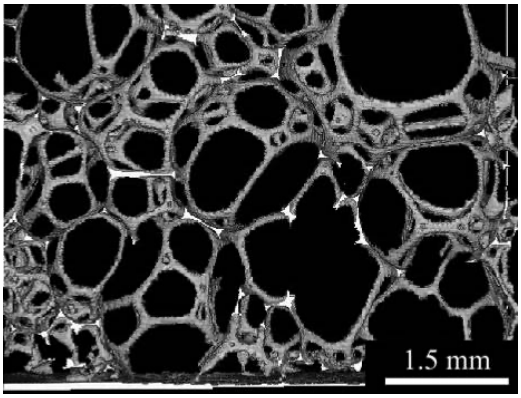
a



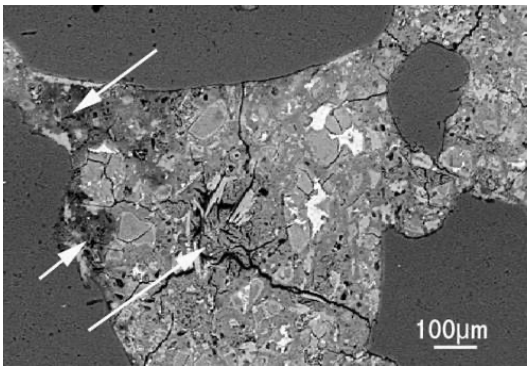
b



c



d



8. The microstructure movie has a series of images of the small scale structure in materials. A selection of images from the movie are shown below. In the movie we asked you to simply observe them – perhaps with a sense of curiosity. We want you to take this further and begin asking questions about the images below:

- What do you notice in the images?
- How big are the images?
- What are the materials?
- If you are not sure what a material is, how might you find out?
- What other questions can you come up with?