XRF/XRD and SEM-EDS questions

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February 5, 2010

1 XRF/XRD

1. XRF provides elemental composition. In the handheld setup, it is much faster than XRD and provides a general sense of the atomic percentages present in a material. XRD uses diffraction patterns to detect crystalline structure.

2. XRD is not good for organic materials, as they often have very similar signatures. Large patches of uniform material are well suited to XRD. It can be used to determine the phase of different elements, as was described in class with Egyptian blue.

3. Handheld XRF can be used on just about anything. Tabletop is limited in that the material needs to be ground and pressed. XRD is limited to small samples, and works best with flat things.

2 SEM-EDS

1. SEM-EDS can produce structural information or material composition information. It additionally provides images of the surface of an object at extremely high magnifications.

2. Samples must be conductive (and non-conductive objects can be coated with carbon, though this precludes compositional information) to be used in the SEM. The object should be flat, polished, and no larger than a half dollar in diameter. It is mounted in a block of resin.

3. EDS only measures the atomic concentrations within a compound; in order for crystal structure data to be collected as well, one must use an XRD. In theory, though, with enough detectors the process can measure almost anything.

4. Non-conductive samples need to be coated in carbon for SEM-EDS. All samples need to be mounted in resin and their surfaces need to be relatively flat. The chambers are now up to 5cm by 3cm, so some objects can be placed inside completely nondestructively.

5. It can be both invasive and destructive, though small objects used in the EDS are generally preserved intact.

6. Anything! The best results are achieved with metals, and the lower level of detection means that imaging of objects which contain high concentrations of low-atomic-number elements is not very successful.

7. The main information presented by SEM is the surface detail of an object — it essentially produces an extremely high magnification image of the object. In addition, EDS can produce the change in material composition across a surface or the surface composition at a specific point.