# X-ray Analysis of Sand

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**Sand Samples**

Death Valley National Park - Mesquite Sand Dunes
White Sands National Monument, New Mexico - dunes
Port San Luis, California - beach near main pier
Hawaii: Beach at South Point on the big Island
Yosemite Valley National Park: Merced River bank
New Jersey: Kingsburg Beach

**Minerals and other things to watch for:**

quartz
K-feldspar
plagioclase
biotite
clinopyroxene (augite)
hornblende
actinolite
olivine
halite
calcite
gypsum
shell/fossil fragments
sed. rock fragments
scoria/basalt fragments

**The Project**

Your goals are

(1) to identify the minerals in each of the six samples
(2) determine which sample came from which location

Yeah, we know that sand is usually mostly quartz. But, not all sand. And even quartz sand may contain other things. To identify the minerals in the samples you will:

-Look at the sample carefully using the binocular microscope
-X-ray the sample
-look at hand specimens of minerals typically found in sedimentary rocks

**Procedure**

Look at each sand sample under the binocular microscope. Write a good, detailed, description in your lab notebook. Note all properties that may be useful, including cleavage/fracture, color, shape, etc. Be sure to figure out how many different minerals, or other things, are in each sample. Also, make note of grain size, roundness, and degree of sorting in the sand samples.

You and your lab partner(s) should grind up small amounts of each sample and mount them on glass slides for X-ray. X-ray according to the schedule worked out with the TA.

If the sand contains many different components, you may wish to consider separating them in some way before X-raying. This makes the X-ray diffractograms much easier to interpret. (See "Suggestions" below.)

**Report**

Descriptions of the sample, and the results of your X-ray analysis must be in your lab notebook. You must also turn in a report summarizing your results. Well written, etc. Specifically, describe

the minerals you see in each sample. What minerals did you identify (visually or by X-ray)? How certain are you that they are there? If you are not sure about a mineral's identification, then you should give a good description of it anyway.

You should figure out which sample comes from which site – and, you must justify/explain how you reached your conclusions for each specimen.

*Note: Your eye is more sensitive than the X-ray machine. Things present in small amounts may show up under the microscope but not in the X-ray pattern.*

**Suggestions:**

-You may wish to go back and forth from the X-ray scan to the microscope several times.
-The samples come from well-known geological locations. I bet there is information on the web or in the library.
-You can help yourself by figuring out what components are likely to be in sand samples of different sorts.
-You can separate out minerals from the samples, or maybe dissolve the sample in acid, before X-ray.