

EaES 350 Laboratory 3: Sedimentary rocks

The study of sedimentary rocks has a wide range of objectives. Sedimentary rocks contain a wealth of information about past environments of deposition, and their identification and mapping in the field forms the basis for paleogeographic reconstruction, which, in turn, is a key component in the big puzzle of Earth history. In addition, detailed description of sedimentary rocks is essential in the search for natural resources, including a diversity of economically valuable minerals.

At the most basic level, sedimentary rocks are subdivided into clastic vs. non-clastic rocks (Fig. 2.1 in your textbook). As you know, the latter group is quite diverse, and includes carbonates, evaporites, and several other categories. Further subdivision of sedimentary rocks occurs on the basis of the size, roundness, and sorting of their component grains, as well as their composition or mineralogy. Additional diagnostic criteria include clast/matrix relationships and the nature of cements that bind grains together. Other diagrams that are relevant to this lab include Figs. 2.2, 2.3, 2.8, 2.9, and 2.11.

This first “rock lab” intends to give you a broad overview of the diversity of sedimentary rock types. Keep in mind, however, that the specimens we will look at only constitute a small cross section of the variability in the real world. The primary goal of this lab is to practice the identification of sedimentary rocks at the level of lithology (e.g., siltstone, limestone, anhydrite, etc.), but wherever possible a more detailed characterization will be attempted. A more sophisticated approach to rock description and identification will follow in the next lab.

The following is a simplified scheme to aid in the identification of clastic and carbonate rocks that you will use during the present and the next lab. It is neither exhaustive nor complete, but it serves as an introduction to identifying some common sedimentary rock types.

[1] Clastic vs. Carbonate

Sometimes this will be obvious, sometimes not. If obvious, skip to [2] or [4]. If not, place one drop of dilute HCl on the specimen. Does it react readily (bubbles)? If YES, the rock is some type of limestone, go to [4] (sometimes bubbles can be hard to see, so use the hand lens). If it does not react, try to powder the rock by scratching it with a nail. If it is too hard to powder, go to [2]. If you can powder it, try the HCl again (one drop!). If it fizzes you are probably dealing with dolomite, go to [4]. If it still does not react with acid, it is neither dolomite nor limestone, go to [2].

Caution: if a rock “fizzes”, do not automatically assume that it is a limestone. Numerous sandstones are cemented with calcite that will react with HCl, but careful examination with a hand lens and scratch plate will show whether the grains are siliciclastic or not.

[2] Clastic – Texture

Describe the texture (both of clasts and matrix, wherever appropriate) in terms of grain size, sorting, and roundness. Sand-size grains are visible with the naked eye or a hand

lens; silt-size grains are visible with a hand lens only, whereas clay-size grains are invisible even with a hand lens. Now go to [3].

[3] Clastic – Mineralogy

Try to determine the mineral composition of the grains if their size allows. The two most common minerals in sand-size or larger grains in clastic rocks include quartz (scratches glass; no cleavage; colored or colorless) and feldspar (may scratch glass; cleavage in two directions; pink, white, or gray). There may also be lithic grains. Wherever appropriate, determine the mineralogy for both clasts and matrix.

[4] Carbonate – Texture and Mineralogy

Many carbonate rocks can be classified by means of texture, quite similar to what applies to clastic rocks. Exceptions include carbonates that are primarily crystalline, which is commonly a result of diagenetic alterations. Describe grain size, sorting, clast/matrix relationships, fossil content, and mineralogy, wherever possible.

Identify the lithology for each of the hand samples, wherever appropriate with the aid of the classification scheme. In some cases it may be useful to sketch a simple drawing labeling important features that might help you to recognize a similar rock type in the future. For each of the specimens, provide a description that includes all the parameters you have been able to describe (grain size, sorting, mineralogy, etc.); remember that data always come prior to conclusions! Try to infer how each of the rocks were formed.