FLORIDA'S ROCKS

CHERT: Chert is also known as flint or flint rock and is a deposit of microcrystalline silica. Florida's cherts are generally gray in color, though some are bright shades of blue, red, yellow and orange. It is characterized by its extreme hardness and is found in association with some of the limestone formations, especially the Ocala. Florida's Native Americans used chert in the manufacturing of axes, spear heads and arrow points.

COMMON CLAY: Another sedimentary rock found throughout Florida, common clay is sticky and is composed primarily of varying amounts of clay minerals, quartz sand, calcite, iron oxides, organic impurities and other materials. Most of Florida's clay was originally deposited as mud in seas, lakes, rivers or deltas. The principal use of common clay in Florida is as an addition to sand in the construction of roads. Clays are also used in the manufacture of cement and lightweight aggregate.

DOLOSTONE: Dolostone is a sedimentary rock that is often associated with limestone deposits; it is composed principally of the mineral dolomite $CaMg(CO_3)_2$. The test for dolomite is the same as that for calcite, except that dolomite effervesces very slowly in cold dilute hydrochloric acid, and more vigorously in warm acid. Dolostone is used for the same purposes as limestone with the exception of cement manufacturing.

LIMESTONE: Various types of limestone underlie all of Florida, but in many parts of the state, the limestone is covered by the sand and clay that forms the land surface. Limestone is a sedimentary rock composed principally of the mineral calcite ($CaCO_3$). It may be easily identified by the application of a drop of cold dilute hydrochloric acid, which causes the calcite particles to effervesce freely. It is used for road base material, concrete and asphalt aggregate, cement manufacturing, fertilizer, soil conditioner and rip rap.

EXAMPLES OF LIMESTONE FORMATIONS FOUND IN FLORIDA:

ANASTASIA FORMATION: The Anastasia Formation is coquina, which is a limestone composed of whole or broken shells and quartz sand grains that are cemented together by calcite. Coquina has been used as a building stone in Florida for over 400 years. It is found at land surface along the east coast from St. Johns to Palm Beach Counties, but is rarely found more than five miles inland.

KEY LARGO LIMESTONE: The Key Largo Limestone is a hard, white to light gray rock which contains numerous fossil corals. The Key Largo Limestone extends on the surface from Soldier Key on the north to the New Harbor Keys just south of Big Pine Key.

MIAMI LIMESTONE: The Miami Limestone is a soft to hard, recrystallized limestone. Near the east coast, it is composed mainly of ooliths with some quartz sand and fossils. Inland, it is a fossiliferous limestone with some sand. Ooliths are small rounded grains that look like fish eggs and are composed of layers of calcite deposited around sand grains or fossil fragments. The Miami Limestone is found at the surface in parts of Broward, Collier, Dade and Monroe Counties.

OCALA LIMESTONE: Generally the Ocala Limestone is soft and porous, but in places it is hard and dense because of cementation of the particles by crystalline calcite. The deposit is remarkable in that it is composed of almost pure calcium carbonate: shells of sea creatures and very tiny chalky particles. Ocala Limestone underlies almost all of Florida, but it is found at the surface of the land only in a small portion of the Florida panhandle and northwestern peninsula.

SUWANNEE LIMESTONE: Not as pure as the Ocala, Suwannee Limestone nevertheless contains a very high percentage of calcium carbonate. The impurities in the Suwannee (principally quartz sand and clay) may amount to ten percent of the rock. The Suwannee is usually harder and more compact than the Ocala.

PHOSPHATE ROCK: "Phosphate rock" is a general term applied to natural deposits of minerals valued chiefly for their phosphorus content. It is an earthy material which varies from a hard rock to a granular, loosely consolidated mass. Florida's phosphate deposits are primarily of the "land pebble" type, which result from marine reworking of phosphatic limestones and deposition of hard pebbles of phosphate in gravel beds. Mining of this land pebble phosphate occurs in central Florida in Hillsborough, Polk, Manatee and Hardee Counties, making the state the nation's leading producer of phosphate rock. Phosphate has a great many uses, the largest of which is in the manufacture of phosphoric acid, superphosphate, triple superphosphate, ground rock and other phosphatic salts for fertilizer.

SANDSTONE: This is another sedimentary rock commonly composed of quartz sand grains cemented together by silica, calcite, iron oxide or other mineral substance. Depending upon the amount and character of the cementing agent, sandstones may be almost any color. The occurrence of sandstone is limited in Florida largely to the red sandy clay formations of the central peninsula and northwestern part of the state. No commercial use is made of Florida sandstone, though it has been used on a very limited scale as a building stone.

FLORIDA'S MINERALS

ANHYDRITE: The mineral anhydrite is an anhydrous calcium sulfate. It is closely related to the mineral gypsum but has a marble-like texture and usually shows no crystal form. Anhydrite has a white, gray or brown color and a white streak. It is harder than calcite and does not effervesce in hydrochloric acid. Anhydrite can be used in fertilizer and cement; however, it is not used commercially in Florida.

CALCITE: The mineral calcite, which makes up limestone, is composed of calcium carbonate ($CaCO_3$). It varies in color from white to colorless to shades of yellow, orange or gray. It breaks up readily into crystalline forms called rhombohedra and can be identified by its effervescence in cold dilute hydrochloric acid.

DOLOMITE: The mineral dolomite, $CaMg(CO_3)_2$, is the principal component of the sedimentary rock dolostone. Dolomite has a white, light brown or pink color, with a white streak. The test for dolomite is the same as that for calcite, except that dolomite effervesces very slowly in cold dilute hydrochloric acid, and more vigorously in warm acid.

FULLER'S EARTH: This name is applied to certain clays that have the ability to absorb oil from various materials. Generally, fuller's earth found in Florida is light green or gray in color, has a greasy feel when wet, and has low specific gravity. Sizable deposits occur near the surface of the ground in Gadsden and Marion Counties. Fuller's earth is used in drilling mud, liquid fertilizer suspenders, paint thickeners, medical drugs, absorbents, pet litter, soaps, paints, polishes, plastics and other materials.

GYPSUM: The mineral gypsum is a hydrous calcium sulfate. It may be transparent to translucent when pure, but is often colored gray, yellow, red, brown or black by impurities. It is soft enough to be scratched by a fingernail and occurs in several forms, two of which are known in Florida. Selenite is a coarsely crystalline, transparent variety composed of flat angular crystals that can be easily split apart. Massive gypsum is a granular variety, showing no crystal form. Gypsum and anhydrite (closely related sulfate minerals) are common minerals deep in the

subsurface of the state. Gypsum is used in wall plaster, wall board, stucco, crayons, casts, cement and fertilizers. It is also used as a flux in glass and ceramics, and as a disinfectant.

Heavy minerals:

ILMENITE: The black to brownish mineral ilmenite (iron titanium oxide) often has a black to brownish red streak. Ilmenite is naturally slightly magnetic, but the magnetism can be greatly increased by heating. In Florida, ilmenite occurs as rounded, sand-size particles. The chief use for the mineral ilmenite is in the manufacturing of titanium oxide pigment for white paints. Ilmenite is used for coating electric welding rods and also as a source of titanium metal.

STAUROLITE: Staurolite is a complex iron, aluminum silicate mineral. It is usually a shade of brown, has a colorless streak and occurs as rounded sand-sized particles. Staurolite is abundant in Florida's heavy-mineral sand deposits. Its principle use is in the production of Portland cement where it substitutes for clay in supplying the necessary alumina and part of the iron required by the cement formula.

RUTILE: Another titanium oxide mineral, rutile is red, red-brown or black in co1or, with a yellow or pale brown streak. It is or has been produced along with ilmenite in Clay, Duval and Indian River Counties. Its uses are the same as those for ilmenite.

ZIRCON: This is a commonly colorless zirconium silicate mineral. In Florida, however, zircon may be red, blue, brown or 1avender with a colorless streak. It occurs as sand-size particles in Florida and may be distinguished from quartz by its brilliant luster and smooth crystal faces, as seen with the aid of a microscope. Zircon withstands very high temperatures, making it suitable for use in bricks and cements for foundries and furnaces. It is also a source for the metal zirconium, which is used as an alloy for various purposes.

KAOLIN: Kaolin is a soft, lightweight, often chalk-like clay that has an earthy odor, and in Florida is generally light in color and associated with large amounts of quartz sand. The state reserve of kaolin occurs in large deposits in the east-central part of the state from southern Clay County to northern Highlands County. A small deposit occurs in west Florida in a narrow belt extending from Jackson County into Santa Rosa County. High grade kaolin, called china clay, is used to manufacture china, porcelain and ceramics. It is also used as filler in paints, paper, soaps, toothpaste, crayons, textiles and other products.

LIMONITE: Limonite, a compound of iron, oxygen and hydrogen, is a yellowish brown to dark brown or black mineral. Impure limonite occurs in many counties in the state, often appearing as a rust-like material staining sand and binding it together. A deposit of fairly high grade limonite is known to exist near Chiefland in Levy County. Commercially, limonite is used as an ore for iron and as a pigment in paints.

QUARTZ: In Florida, quartz primarily occurs in surface deposits of unconsolidated small grain-sized sand particles. Though common quartz sand is the most abundant surface material in Florida, the deposits are not extensively developed. Quartz sand is used for making glass and for grinding and polishing metals. Other uses are as molding sand, blast sand and fill material.

FURTHER READING

Campbell, Kenneth M., 1986, The Industrial Minerals of Florida: Florida Geological Survey Information Circular No. 102, 94 p.; http://www.uflib.ufl.edu/ufdc/?s=fgs&m=hd2J&i=74918

Lane, Ed (Editor), 1994, Florida's Geological History and Geological Resources, Florida Geological Survey Special Publication No. 35, 64 p.; http://www.uflib.ufl.edu/ufdc/?b=UF00000124&v=00001

Lane, Ed, 1987, Guide to Rocks and Minerals of Florida: Florida Geologica1 Survey Special Publication No. 8, 61 p.; www.dep.state.fl.us/geology/geologictopics/rocks/rock_minerals.pdf

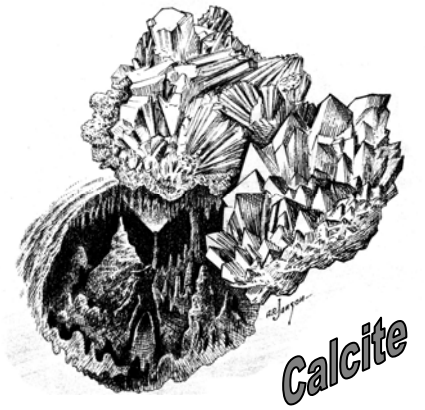
Scott, Thomas M., 1992, A Geological Overview of Florida: Florida Geological Survey Open File Report No. 50, 78 p.; http://aquacomm.fcla.edu/1509/

Spencer, Steve, 1993, Industrial Mineral Operations of Florida: Florida Geological Survey Map Series 139, Scale: 30 miles to 1 inch, http://purl.fcla.edu/fcla/ic/UF00015030

Spencer, Steve, 1999, Industrial Minerals Industry Directory of Florida, Florida Geological Survey Information Circular No. 112, 26 p.; http://www.uflib.ufl.edu/ufdc/?s=fgs&m=hd2J&i=164410

Spencer, Steve and Rupert, Frank, 2003, Florida's Industrial Minerals - Making Modern Life Possible: Florida Geological Survey Poster No. 9, Color, 22"X37"; http://www.dep.state.fl.us/geology/images/Poster9.jpg

FLORIDA'S ROCKS AND MINERALS



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COMPILED & UPDATED BY
J.M. LLOYD, P.A. BOND
& S.E. RAMDEEN

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

FLORIDA GEOLOGICAL SURVEY
903 W. TENNESSEE STREET
TALLAHASSEE, FL 32304
(850) 488-9380
www.dep.state.fl.us/geology

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