MINERAL OF THE MONTH

BAUXITE

The term **bauxite** describes a mixture of aluminum and iron oxide minerals commonly mixed with the clay mineral kaolinite. The dominant oxides of aluminum found in bauxite are gibbsite and boehmite; hematite and goethite are the iron oxides associated with bauxite. Bauxite is more properly classified as a rock because of its distinctive multi-part composition.

Bauxite ore is the chief source of aluminum worldwide. It typically occurs as surface or near-surface deposits where it is most commonly strip mined. Most bauxite deposits are found in tropical or subtropical climates, where high rainfall amounts result in extensive weathering and leaching of aluminous silica-rich rocks such as granite, gneiss, and some shales. If drainage is good, the weathered material becomes concentrated in aluminum minerals as the iron oxide and clay components are lost. Aluminum-enriched bauxite is the end-result of this process.

Aluminum is extracted from bauxite ore through an electrolytic process. The ore is mixed at high temperatures with a molten catalyst called cryolite. Metallic aluminum forms at the cathode in this process, and oxygen and carbon dioxide are released at the anode. Electrolysis is a very energy-intensive process and accounts for the relatively high cost of aluminum metal.

Technical Information (dominant aluminum oxides only):
- **Chemical Formula** – Gibbsite $\text{Al(OH)}_3$; Boehmite $\text{AlO(OH)}$
- **Composition** – Aluminum hydroxide; aluminum oxide-hydroxide
- **Crystal System** – monoclinic-prismatic; orthorhombic dipyramidal system
- **Hardness** – 2.5-3 (Mohs scale)
- **Streak** – white
- **Cleavage** – Basal one direction – good to perfect
- **Mineral group** – Hydroxides and oxides containing hydroxyls

In hand-samples, bauxite frequently exhibits a textural feature of aggregated spheroidal shapes. These rounded nodules are called **pisolites**. Pisolites form, among other places, in aluminum-rich soils that are undergoing extensive leaching. As leaching progresses, iron and clay are gradually removed from the soil. This allows the oxides of aluminum that compose bauxite to become concentrated. Differences in iron content in these soils cause the nucleation of aluminum at different sites in the aluminum-rich matrix, and continued leaching results in the segregation of aluminum oxides, iron-oxides, and clays into different layers around the nucleation sites. This leaching process is generally referred to as lateritization. This is a term that describes soil formation in tropical and subtropical environments and is not actually specific to bauxite genesis.

Bauxite occurs in our area in two principal regions: in a belt extending from south central Alabama stretching into south-central Georgia (roughly from Eufaula, Alabama to Andersonville, Georgia) and in the Valley and Ridge physiographic province of north Georgia, specifically Bartow and Floyd Counties. Most of the samples provided in the tray this month are from these two areas.