

## Glossary

**Biogenic textures:** physical characteristics of goethites formed by iron replacement/precipitation on the outer shell envelopes of microorganisms, following by their eventual death and fossilization (Montiero et al., 2014; Levett et al., 2016, 2020). Biogenic textures are also produced by rapid and pervasive goethite replacement of wood fragments or dead organisms that may allow the complete preservation of plant cells and delicate soft tissues (e.g., McCurry et al., 2022). Porous (yellow) goethite replacing wood fragments or soft tissues may have poor He retentivity, imposing challenges for its use in (U-Th)/He geochronology.

**Colloform (or botryoidal) goethite:** botryoidal goethite precipitates in empty spaces when iron species in solution interact with the exposed surfaces of host rocks, previously formed goethites, or other supergene phases (e.g., cryptomelane, malachite, etc.). Colloform goethite displays concentric growth bands showing clear bases and terminations; commonly, each band consists of goethite crystallites oriented in the growth direction. In some cases, a goethite band is overlain by a different mineral band (e.g., Mn-oxides, hematite, Cu-carbonate) before resumption of goethite precipitation. Tens-of-centimeter-thick colloform goethite is common in weathered massive sulfide deposits, karst environments, and some weathered pegmatites. The size and purity of colloform goethite suggest high concentrations of iron in solution. Colloform goethites provide ideal samples for geochronology due to their mineralogical purity and often the protracted history of iron precipitation they record. When colloform goethite forms features similar to a bunch of grapes, they are called botryoidal goethite.

**Duricrust:** a horizon in a weathering profile that is indurated by authigenic cements. It can occur at the surface or in the shallow subsurface, and its mineralogy depends on the composition of the weathered rocks and environmental conditions. If the cements are iron oxyhydroxides, the duricrust is called a ferricrete; if the cement is amorphous, cryptocrystalline, and crystalline silica, the duricrust is called a silcrete; there are also calcretes (calcite-cemented), manganocretes (Mn-oxide-cemented), bauxites (gibbsite- and/or boehmite-cemented), etc.

**Gossan:** iron-rich leached caps developed during weathering of rocks rich in sulfides.

**Hypogene minerals:** primary minerals of igneous, magmatic-hydrothermal, hydrothermal, and metamorphic origins.

**Lateritic profile:** the product of the prolonged and intense rock weathering at Earth's surface that leads to the formation of chemically and mineralogically stratified profiles. A typical lateritic profile will include all or most of the following horizons, from top-to-bottom: soil, Fe-Al duricrusts, mottled zone, bleached zone, saprolite, saprock, and unweathered bedrock.

**Limonite:** generic term used to designate a mixture of fine-grained iron oxides and hydroxides often mixed with clay minerals and other phases. Limonite is often used as a mineral name, but limonite is not a recognized mineral by the International Mineralogical Association. In nickel laterite profiles, a soft horizon formed mostly of fine-grained goethite that overlies the saprolite is commonly called the "limonite horizon".

**Massive goethite:** Massive goethites lack growth bands notable in botryoidal goethites. Massive goethites may show complex textures associated with multiple nucleation sites, cross-cutting goethite veins, Fe-metasomatism of existing rocks and minerals, and the possible coexistence of the newly formed goethite with remnants of primary Fe-bearing minerals such as magnetite, hematite, and ilmenite.

**Pisolith:** a pisolith is a spherical to semi-spherical pedogenic concretion formed of  $\mu\text{m}$ -thick goethite concentric bands around a central nucleus composed of pure goethite or fragments of rocks, sediments, pieces of broken pisoliths, or ferruginized wood. They occur in diverse geological environments and can be detrital or formed in situ.

**Pisolithic goethite:** goethite precipitated as concentric layers around a pisolith's nucleus.

**Pore-filling goethite:** goethite cement filling small open spaces within weathered rocks, sediments, and duricrusts. Generation after generation of iron-rich solutions penetrate the pores, often in waves, partially corroding the mineral matrix and precipitating thin layers of goethite. Pore-filling goethites also precipitate within and around root casts.

**Supergene processes:** any process associated with the downward transport of weathering solutions and their dissolved loads.

**Supergene minerals:** minerals formed by the process above.