

CLEAVAGE AND FRACTURE

Some minerals show *cleavage*—they always break on a flat surface. Other break on curved or rough surface—they show *fracture*. These patterns result from how the atoms are arranged in the minerals.

CLEAVAGE

Halite, galena, calcite, and fluorite can be used to teach cleavage. Most people have halite in their homes—it's common name is table salt." But it has already been crushed into tiny pieces when brought into the home, so its ability to split into small cubes is not obvious. Galena will break into larger, easily visible cubes. Calcite breaks to form a rhombohedral (diamond-shaped) solid, without perpendicular sides. Fluorite splits to form an octahedral (8-sides) solid. Many students look at samples in a classroom and think they have been cut with a saw.

Micas are one of the best minerals to use in teaching cleavage. In both muscovite ('white mica') and biotite ('black mica'), the atoms are tightly bound to each other in sheets. But the bonds between sheets is weak. So micas can be split easily. Graphite also cleaves easily, which makes it useful as 'pencil lead.' Feldspars cleave in two directions, but not in the third. Cleavage, then, is a visible result of the atomic structure.

FRACTURE

Fracture surfaces tend to be irregular or curved, unlike flat cleavage surfaces. Many common materials show fracture: the curved surface of broken glass, the rough surface of many metals, the powdery surface of clays. Many non-metallic minerals are brittle and shatter on impact. Metallic minerals, such as gold and copper, are *tough* and can be broken only with difficulty.

Some minerals that can be used in the classroom to explain fracture include:

- Quartz: curved (*conchoidal*) surface
- Copper: jagged or rough surface
- Limonite: earthy or powdery
- Serpentine splintery or fibrous surface

Many common materials which are not minerals also show fracture when broken, such as glass, bricks, concrete, and asphalt.

Adapted from: "Cleavage, Parting, and Fracture" by Earl R. Verbeck, Sterling Hill Mining Museum, Ogdensburg, NJ, USA