Lustrous Behavior

The splendor of diamond, the dullness of clay and the gleam of galena are all examples of mineral luster. Luster is an important mineral property that refers to several different sorts of interaction of light with minerals.

Luster is defined by the *Glossary of Geology* as "the appearance of a mineral in reflected light." This is a definition typical of those found in most mineral texts, and it is easily misunderstood. When I was a kid, I bounced light off of a mirror onto a mineral's surface, to see what it looked like in "reflected light." I was confused and disappointed because the mineral looked the same as it did in "normal light"! I was being mislead by a confusing definition. When told that the two important types of luster are metallic and non-metallic, most people start to understand. There is something about the way metal looks that makes it easy to recognize from a distance, some light property that is independent of its color. After all, we can tell a piece of gray plastic from a piece of gray metal without them picking them up.

A mineral with a metallic luster will absorb or reflect virtually all light that strikes its surface. Since no light penetrates into them, metallic minerals are opaque in even the thinnest slivers. This property has to do with the closeness of the atom spacing in the structure and the kind of bonds holding the atoms together.

A non-metallic mineral allows at least some light to penetrate through it. Some non-metallic minerals are transparent. Others will let light through on only thin edges. Biotite mica is a good example. Big chunks of biotite are dark brown and seem opaque. However, if you break off tiny flakes and hold them up to the light, you can see, especially with of a handlens, that light gets through the biotite.

A few minerals, such as goethite and sphalerite, show submetallic luster in which a tiny amount of light penetrates into them. We may not be able to detect this on thin edges with the eyes, but the light penetration is enough so that the mineral, though dark, does not have the typical surface appearance of a metal. Non-metallic minerals are commonly subdivided into different luster categories due to the way light behaves when it hits the mineral's surface, or as it passes through the mineral. The most common non-metallic lusters are adamantine, vitreous, resinous, greasy, and pearly. Adamantine luster is the brilliant luster for diamonds and other gemstones. The sparkle originates from the slow speed of light through the mineral and the way it is bent as it passes through. Diamond cuts are angled to take advantage of this and focus and emphasize the light rays still more. Vitreous, or glassy, lusters do not bend or slow the light as much, producing

a shiny, but not spectacular, gleam. A resinous luster has the appearance of broken shellac and is due to a further slowing of the light. Greasy lusters are due to the light interacting with a surface film on the mineral. A good example is halite, which usually has a film of absorbed water on its surface. Another example is a refrigerator door opened by too many dirty hands! Pearly lusters occur when light is split into its different colors by layers below the minerals surface, acting as natural prisms.

Some minerals such as clay have a dull or earthy luster. These minerals consist of masses of tiny, randomly oriented particles that scatter the light. Instead of absorbing the light or reflecting it back at a particular angle, each grain reflects some of the light back in a different direction. That makes the surface look dull, with no shine in any one direction.

And, at the risk of ending on as dull note, that is the sparkling story of luster.

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