

# Lunar Glossary

## *Note to the User:*

A number of terms are unique to lunar science or are at least used in a specialized sense. The following brief glossary is an attempt to define these unique terms plus provide definitions of terms which are only rarely used in the geologic literature. In part the glossary is adapted from the Proceedings of the Fifth Lunar Science Conference (Vol. 1) and has been modified to suit the needs of this text.

## Glossary

*Accretion.* The process by which planetary bodies increase in size by incorporating interplanetary material.

*Aeon.*  $10^9$  yr.

*Agglutinate.* A common particle type in lunar soils, agglutinates consist of comminuted rock, mineral and glass fragments bonded together with glass. The glass is black or dark brown in bulk, but pale brown to very dark brown in thin section, and is characteristically heterogeneous, with dark brown to black flow banding or "schlieren".

*Albedo.* The ratio of the brightness of a reflecting object to that of a theoretical perfectly diffusing (i.e., obeying Lambert's Law) flat surface at the same position and having the same projected surface area.

*Alkalic high-alumina basalt.* Lunar rocks with 45–60% modal or normative plagioclase; mafic minerals predominantly low Ca pyroxene with varying amounts of olivine; total alkalis and phosphorus are relatively high. Compositionally equivalent to KREEP basalt.

*Anorthosite.* Term used for lunar rock with over 90% modal or normative plagioclase. Has also been used rather loosely to encompass all feldspathic rocks in the lunar highlands.

*Anorthositic gabbro.* Used for lunar rocks with 65–77.5% modal per cent plagioclase (normative plagioclase has been used to classify particles from compositional data).

- Anorthositic norite.* Used for lunar rocks with 60–77.5% modal or normative plagioclase; low Ca pyroxene dominant over high Ca pyroxene.
- Armalcolite.* New lunar mineral ( $\text{Mg}_x > 1 \text{ Fe}_{1-x} \text{ Ti}_2\text{O}_5$ ) that is isomorphous with ferropseudobrookite and karoosite. It is generally interpreted as a primary phase and is commonly rimmed by ilmenite.
- Basalt.* Fine grained, commonly extrusive, mafic igneous rock composed chiefly of calcic plagioclase and clinopyroxene in a glassy or fine-grained groundmass. Lunar basalts contain plagioclase of bytownitic or anorthitic composition and ilmenite as a major phase. Term is also used in a purely compositional sense for lithic fragments and glasses.
- Base surge.* A debris cloud near the ground surface that moves radially from a chemical, nuclear or volcanic explosive center or from a meteoritic impact center. The first use was to describe clouds at the base of shallow thermonuclear explosions. Lunar applications of the term are based on photogeologic interpretations of patterned ground or dunes around large lunar craters such as Tycho. Accretionary structures in soil breccias have been interpreted as having formed in impact-generated, hot base surge clouds.
- Breccia.* Clastic rock composed of angular clasts cemented together in a finer-grained matrix.
- Cataclastic.* A metamorphic texture produced by mechanical crushing, characterized by granular, fragmentary, or strained crystals.
- Cumulate.* A plutonic igneous rock composed chiefly of crystals accumulated by sinking or floating from a magma. Terrestrial cumulates are usually structurally layered (layers varying in the proportion of cumulus phases) but textural criteria could also be applied.
- Dark matrix breccia.* Polymict breccia with dark-colored glassy or fine-grained matrix. Used specifically for breccias containing lithic clasts angular to spherical glass fragments, and single crystals in a matrix of brown glass.
- Diaplectic glass.* Glass formed in the solid state from a single mineral grain due to the passage of a shock wave.
- Dunite.* Used for lunar rocks with over 90% modal or normative olivine.
- Ejecta.* Materials ejected from the immediate crater by a volcanic explosion or meteoroid impact.
- Exposure age.* Period of time during which a sample has been at or near the lunar surface, assessed on the basis of cosmogenic rare gas contents, particle track densities, short-lived radioisotopes, or agglutinate contents in the case of soil samples.
- Fra Mauro basalt.* Defined originally from glass compositions in soils at the

Apollo 14 site. A basaltic composition with the approximate composition (in weight per cent)  $\text{SiO}_2$  48,  $\text{TiO}_2$  2,  $\text{Al}_2\text{O}_3$  18,  $\text{FeO}$  10,  $\text{MgO}$  9,  $\text{CaO}$  11,  $\text{Na}_2\text{O}$  0.7,  $\text{K}_2\text{O}$  0.5,  $\text{P}_2\text{O}_5$  1. Compositionally equivalent to KREEP basalt.

*Grabbroic anorthosite*. Used for lunar rocks with 77.5–90% modal or normative plagioclase (normative plagioclase from compositional data has been used to classify lithic fragments and glasses).

*Granite*. Compositional term used for lunar rocks or glasses rich in Si and K. Common composition is approximately  $\text{SiO}_2$  70,  $\text{Al}_2\text{O}_3$  14,  $\text{FeO}$  2,  $\text{MgO}$  1,  $\text{CaO}$  2,  $\text{Na}_2\text{O}$  1,  $\text{K}_2\text{O}$  7 (weight per cent). The term *rhyolite* has been used in the same compositional sense.

*High-alumina basalt*. Lunar rocks with 45–60% modal (or normative) plagioclase; mafic minerals predominantly low Ca pyroxene with varying amounts of olivine. Used to encompass both low-alkali high-alumina basalt and alkalic high-alumina basalt. Commonly also used for high-alumina basalt compositions like KREEP basalt but with substantially lower K and P; i.e. equivalent to low-alkali, high-alumina basalt. Not equivalent to terrestrial high-alumina basalt.

*Highland basalt*. Compositional term for rocks or glasses with the composition of very aluminous basalt (approximate composition  $\text{SiO}_2$  45,  $\text{TiO}_2$  .4,  $\text{Al}_2\text{O}_3$  26,  $\text{FeO}$  6,  $\text{MgO}$  8,  $\text{CaO}$  15,  $\text{Na}_2\text{O}$  .3,  $\text{K}_2\text{O}$  <.1 weight per cent).

*Hornfelsic*. A fine-grained metamorphic texture of equidimensional grains with no preferred orientation. Porphyroblasts or relict phenocrysts may be present.

*Impact melt*. Melt produced by fusion of target rock due to impact of a meteoroid.

*Intersertal*. A groundmass texture in a porphyritic rock in which unoriented feldspar laths enclose glassy or partly crystalline material other than augite.

*Light matrix material*. Breccias with light colored feldspathic matrices. Used specifically for feldspathic breccias with anorthositic bulk compositions and generally with some recrystallization, or with unrecrystallized matrices.

*Mare basalt*. Basaltic igneous rocks from the mare regions of the moon characterized by high  $\text{FeO}$  (>14), commonly high  $\text{TiO}_2$ , low  $\text{Al}_2\text{O}_3$  (<11) and low-alkali contents. Major minerals are clinopyroxene and calcic plagioclase, with lesser Fe-Ti-Cr oxides, metallic iron, and troilite. Olivine or a  $\text{SiO}_2$  polymorph or both are common.

*Mascon*. Concentration of mass, apparently at a relatively shallow depth within the moon, commonly associated with circular mare basins.

*Maskelynite*. Plagioclase that has been transformed by shock in the solid state to a glass. Equivalent to diaplectic or thetomorphic plagioclase glass.

*Meteoritic component*. These portions of lunar samples contributed by meteoroids which impacted after early lunar differentiation patterns had become established; can be detected through siderophile and volatile element abundance patterns.

*Monomict breccia*. A breccia formed by fracturing and mixing of material from a single source without admixture of unrelated material (cf. *Polymict breccia*).

*Norite*. Rock of basic composition consisting essentially of plagioclase and orthopyroxene; clinopyroxene should not exceed half of the total pyroxene content. Term has been used for a variety of lunar rocks that are generally basaltic in composition with orthopyroxene as a major phase; also used for basaltic compositions in which the normative pyroxene is low in Ca.

*Noritic anorthosite*. Used for lunar rocks with 77.5–90% modal or normative plagioclase; low Ca pyroxene dominant over high Ca pyroxene.

*Oikocrysts*. In a poikilitic or poikiloblastic texture, the crystal that encloses the chadacrysts.

*Ophitic*. A basaltic texture characterized by laths of plagioclase partially enclosed by anhedral grains of pyroxene. Believed to represent contemporaneous crystallization of the two minerals, rather than a sequence as in poikilitic texture.

*Polymict breccia*. A breccia containing fragments of different compositions and origins (cf. *Monomict breccia*).

*Regolith*. Lunar regolith is the fragmental debris, produced principally by impact processes, which lies on bedrock.

*Regolith breccia*. See *Soil breccia*.

*Rhyolite*. See *Granite*.

*Rille*. Valleys on the lunar surface; classified by shape as straight, arcuate, or sinuous.

*Secondary crater*. Crater produced by impact of a projectile ejected from the lunar surface upon meteoroid impact.

*Soil*. The term soil may . . . "be loosely applied to all unconsolidated material above bedrock that has been in any altered or weathered". Lunar soils are primarily derived by the physical process of impact comminution and impact fusion of detrital particles.

*Soil breccia*. Polymict breccia composed of cemented or sintered lunar soil.

*Soil maturity*. Maturity of a soil refers to the degree of reworking by

micrometeoroids, as evidenced by glass content, grain size parameters, relative amount of grains with high solar flare track densities, solar wind gas content, and other parameters shown to be related to the time of exposure at the lunar surface.

*Troctolite.* Terms for lunar rocks consisting essentially of plagioclase and olivine with little or no pyroxene. If spinel-bearing, it is termed spinel-troctolite.

*Vitrification.* Formation of a glass from a crystalline precursor generally by impact melting.