

## GLOSSARY OF DIAMOND GEOLOGY

From S.B. Shirey and J.E. Shigley, "Recent Advances in Understanding the Geology of Diamonds," Winter 2013 *Gems & Gemology*, pp. 188-222. Some of the definitions here are adapted from Neuendorf et al.'s *Glossary of Geology*, 5th edition (American Geological Institute, 2011).

**Accretion:** the process by which two continental masses collide and weld together, resulting in a larger continent.

**Adiabatic melting:** the melting of upward-moving mantle rocks as a result of depressurization, which leads to the formation of magmas.

**Alluvial:** a sorted or semi-sorted sediment deposited during comparatively recent geologic time by a stream or other moving body of water, and which occasionally contains concentrations of valuable minerals.

**Archean:** the earliest of the four principal divisions of geologic time, extending from 2.5 to about 3.8 billion years ago.

**Asthenosphere:** a part of the upper mantle below the lithosphere that is weak and capable of mobility, convection, and melting.

**Basalt:** a dark-colored, fine-grained igneous rock, composed mainly of plagioclase feldspar and pyroxene, that is formed by the solidification of magma near the earth's surface.

**Breccia:** a coarse-grained rock of sedimentary or igneous origin that is composed of angular rock fragments held together by a mineral cement or fine-grained matrix. *Brecciation* is the process of forming a breccia or the magma that crystallizes such a rock.

**Carbonatite:** a carbonate rock of magmatic origin.

**Continental crust:** the portion of the earth's crust that underlies the continents and continental shelves, ranging from about 35 to 60 km thick.

**Craton:** a large, ancient, and geologically stable portion of the continental lithosphere that has been little deformed for a prolonged period of geologic time. In diamond geology, a craton is the Archean portion of a much larger cratonic block, in which diamondiferous kimberlites are located on-craton. Non-diamondiferous kimberlites are located off-craton.

**Crust:** the earth's outermost layer or shell, consisting of the thicker continental crust and thinner oceanic crust.

**Dike:** a tabular intrusion of igneous rock that cuts across the bedding or structure of preexisting rocks.

**Eclogite:** a granular, ultramafic rock composed mainly of almandine-pyrope garnet and omphacite pyroxene that is formed by the metamorphism of basalts from the oceanic crust that have been subducted into the mantle.

**Emplacement:** referring to igneous rocks that intrude into a host rock or country rock, usually higher in the crust.

**Equilibrium:** a thermodynamic state where two minerals or components will not undergo further change at a given pressure and temperature.

**Exsolved:** when a mineral is crystallized directly in a solid host mineral, usually due to a decrease in pressure or temperature or both.

**Friable:** easily crumbled, as with a strongly weathered rock.

**Geothermal gradient:** the rate of increase of temperature with depth in the earth, with an average value of approximately 25°C per km.

**Geothermobarometer:** a pair of minerals whose chemical composition is temperature and pressure dependent, and which can be used to estimate the conditions under which the minerals formed.

**Glaciofluvial:** deposited by the streams or rivers flowing from glaciers.

**Grade:** a general term for ore content, in this case diamond abundance.

**Hybrid:** an igneous rock whose chemical composition results from assimilation of the country rock into a magma.

**Igneous:** a rock that solidified from molten or partially molten magma (the term is also applied to the geologic processes leading to or related to the formation of igneous rocks).

**Indicator minerals:** minerals that are geologically associated with diamonds but much more abundant, and which can be used to explore for diamond deposits.

**Island arc:** a curved chain of islands arising from the deep-sea floor that is the volcanic product of subduction.

**Kimberlite:** a hybrid, volatile-rich potassic ultramafic igneous rock composed principally of olivine, along with lesser amounts of phlogopite mica, diopside pyroxene, serpentine, calcite, garnet, ilmenite, and spinel. It can contain foreign rock fragments (xenoliths such as peridotite and eclogite) and crystals such as diamond (xenocrysts). Kimberlite is the chief host rock for commercial diamond mining.

**Lamproite:** a group of related dark-colored intrusive or extrusive igneous rocks that are rich in potassium and magnesium and characterized by minerals, including leucite, phlogopite, and feldspars. Diamondiferous varieties carry dominant olivine and lack feldspar.

**Lamprophyre:** a group of dark-colored intrusive igneous rocks characterized by a high percentage of mafic minerals (such as biotite mica, hornblende, and pyroxene) as larger crystals, set in a fine-grained groundmass composed of the same minerals plus feldspars or feldspathoids.

**Lithosphere:** the solid outer portion of the earth, consisting of the crust and upper mantle, that is approximately 100 km thick.

**Longshore (or littoral) current:** an ocean current caused by the approach of waves to a coastline at an angle so that it flows parallel and near to the shore.

**Macrodiamond:** a rough diamond that is more than 0.5 mm in diameter.

**Mafic:** a dark-colored igneous rock chiefly composed of iron- and magnesium-rich minerals.

**Magma:** molten material generated with the crust or upper mantle from which igneous rocks are derived by solidification, and that is capable of intrusion at depths in the crust or extrusion at the surface as lava or a pyroclastic ash flow.

**Magmatic:** related to or derived from magma.

**Mantle:** the zone between the earth's crust and core, consisting of a rigid lithosphere and an underlying asthenosphere of plastically flowing rock.

**Mantle keel:** the downward-protruding, thickened portion of the lithospheric mantle that resides under the continental crust of the craton, and which has had an extended period of attachment to the craton.

**Melt depletion:** an igneous process by which melt is removed, leaving a residual rock that is more refractory than the original starting composition.

**Metamorphism:** the process that causes mineralogical, chemical, or structural changes in solid rocks by exposing them to new pressure and temperature conditions by burial within the crust or mantle.

**Metasomatic:** formed by metasomatism, a geologic process that produces new minerals in an existing rock by replacement.

**Microdiamond:** a rough diamond less than 0.5 mm in diameter.

**Mid-ocean ridge:** a continuous chain of underwater mountains along the sea floor that mark the volcanic centers from which new oceanic crust is formed from magma being brought up by convection from the mantle. The solidified magma forms basalt, which spreads away along both sides of the ridge to form new oceanic crust.

**Mobile belt:** a long, relatively narrow crustal region of former tectonic activity.

**Mountain building (or orogeny):** the processes by which geologic structures in mountainous regions are formed. These processes include thrusting, folding, faulting, and (at depth) metamorphism and igneous intrusions.

**NAL:** Na- and Al-bearing mineral that occurs in basaltic-composition rocks subjected to pressures and temperatures equivalent to the top of the lower mantle (Harte, 2010).

**Nuclide:** a species of atom characterized by certain number of protons and neutrons in its nucleus.

**Oceanic crust:** the portion of the earth's crust that underlies the ocean basins, and that ranges in thickness from about 5 to 10 km.

**Peneplaned:** leveled to a quite flat surface by the sum of erosional geologic processes.

**Peralkaline:** a chemical classification of igneous rocks in which the molecular proportion of aluminum oxide is less than sodium and potassium oxides combined.

**Peridotite:** an ultramafic igneous rock composed of

olivine, orthopyroxene, clinopyroxene, and perhaps garnet, that is thought to be the most common and abundant rock type in the mantle.

**Phenocryst:** the large, conspicuous crystals set in a fine-grained groundmass in a porphyritic igneous rock.

**Placer:** a surface deposit consisting of valuable minerals that have been weathered out and then mechanically concentrated (normally by flowing water) in alluvial sediments.

**Plate tectonics:** a theory in which the lithosphere is divided into a number of thin, rigid crustal plates which move across the earth's surface and interact with one another at their boundaries along zones of tectonic and seismic activity.

**Plume:** an upwelling of molten rock that originates near the core-mantle boundary, and then rises upward through the mantle.

**Pyroclastic:** an igneous rock composed of angular rock fragments that originate from a volcanic explosion.

**Radioactive decay:** the spontaneous disintegration of the atoms of certain nuclides into other nuclides, which may be stable or undergo further decay until a stable nuclide is created.

**Regolith:** the fragmental and unconsolidated rock material which nearly everywhere forms the surface of the land and overlies the bedrock.

**Remobilized:** a once-molten igneous rock that has been remelted.

**Rifting:** a plate tectonic process that creates a zone where the lithosphere has ruptured due to extension.

**Subduction:** the process where one lithospheric plate descends beneath another plate.

**Superdeep:** an unusual type of diamond that originates at depths well below the base of the lithospheric mantle keel from within the convecting mantle.

**Surficial:** occurring at the earth's surface.

**Tectonic stability:** a region of the earth that is not undergoing active geologic processes such as volcanism, mountain building, subduction, faulting, or rifting. These regions have no or very few earthquakes.

**Thermal pulse:** a wave of heat passing through the crust carried by fluids or magma from below.

**Till:** an unsorted glacial deposit usually composed of finely ground rock flour, which may also contain dispersed, rounded cobbles or boulders.

**Ultramafic:** an igneous rock composed mainly of mafic minerals.

**Uplift:** a structurally high area in the crust that was produced by the raising or uplifting of rocks.

**Xenocryst:** a large crystal in an igneous rock that is foreign to the rock in which it occurs.

**Xenolith:** an inclusion of a foreign rock in an igneous rock.