
Glossary

Acid: describes igneous rock containing more than 10 per cent quartz and having a chemical composition of more than 66 per cent silica, SiO_2 (cf. intermediate and basic).

Aeolian: describes deposits formed from wind-transported sediments.

Agglomerate: pyroclastic rock consisting of fragments greater than 2 mm in size (cf. tuff).

Alkali(-ne): describes igneous rock in which the feldspar is mainly sodium and/or potassium rich (as against calc-alkaline in which feldspar is mainly calcium rich).

Amygdale (-oidal): gas bubble in lava infilled with a mineral, e.g. quartz, calcite or zeolite.

Andesite: fine-grained intermediate igneous rock characterised by the presence of oligoclase or andesine as the feldspar; occurs as extensive lava flows often associated with subduction-related volcanicity, or may form small intrusive bodies.

Anticline: fold with the oldest strata in the core, generally but not necessarily convex-upwards (cf. syncline).

Antiform: convex-upwards fold with no available information on the direction of younging in the folded sequence (synform is convex-downwards).

Aphyric: a uniformly fine-grained texture in igneous rocks (cf. porphyritic).

Aplite: a fine-grained rock of granitic composition, usually occurring in veins or dykes.

Arenite (-aceous): any detrital sedimentary rock consisting of particles in the sand size range.

Argillite (-aceous): any detrital sedimentary rock consisting of particles of silt size or less.

Arkose: sandstone containing an abundance of detrital feldspar grains.

Aureole: the zone of thermally metamorphosed rock surrounding an igneous intrusion.

Autobreccia: a fragmentary rock produced by the process of igneous emplacement (usually extrusive) and not by subsequent erosion or tectonism.

Autolith: an inclusion in an igneous rock to which it is genetically related.

Axial plane: that plane passing through all points on a fold hinge, throughout the fold's development, and bisecting the angle between the fold limbs.

Axial-plane cleavage: cleavage, usually slaty, developed parallel to the axial plane of a fold.

Basalt: fine-grained basic igneous rock containing calcium-rich plagioclase feldspar and pyroxene (usually augite), and often also olivine, hornblende and magnetite in significant amounts; occurs as lava flows and in small intrusions where cooling has been rapid.

Basic: describes igneous rock containing no free quartz and having a chemical composition of between 45 and 55 per cent silica, SiO_2 (cf. acid, intermediate).

Bentonite: assemblage of clay minerals formed by the alteration of glassy volcanic ash.

Biostratigraphical zonal scheme: series of divisions of the age of rocks based on their fossil content.

Biozone: time range of a certain species or assemblage of species.

Bivalves: group of marine or freshwater invertebrates that secrete an exterior calcitic shell of two valves, usually the same size.

Boninite: an unusual variety of basalt lava with an exceptionally high content of magnesium, chromium and nickel, coupled with high levels of silica. Such lavas are characteristic of the frontal zones of oceanic volcanic island arcs.

Botryoidal: describes minerals occurring as aggregates with rounded surfaces.

Boudinage: the stretching of a planar layer or body of rock to produce a series of lenses separated by narrowed necks.

Breccia: (1) detrital sedimentary rock containing angular fragments greater than 2 mm in size, either laid down in water or subaerially; angularity indicates that fragments have not been transported very far. (2) a zone of shattered rock, usually recemented, produced tectonically by fault movement.

Chert: finely crystalline silica, SiO_2 , occurring as bands or nodules in sedimentary sequences.

Cleavage: parting imposed on a rock during tectonism, either by alignment of recrystallised minerals or by physical microdeformation.

Crenulation cleavage: cleavage planes, whether micaceous layers or sharp breaks, which are separated by thin slices of rock containing an earlier, cross-cutting planar fabric which is deformed between the new crenulation planes.

Slaty cleavage: a penetrative fabric caused by mineral orientation in closely spaced layers throughout a rock.

Transecting cleavage: cleavage planes genetically related to a fold structure to which they are nevertheless not axial planar. Typically the cleavage planes are parallel to the axial plane in cross-section but cut obliquely across the fold in plan view. Generation in a varying stress field is the likely explanation.

Conglomerate: detrital sedimentary rock containing rounded fragments greater than 2 mm in size, usually deposited in water, the roundness of the fragments resulting from erosion during transportation.

Conjugate: applied to faults or joints which formed during the same deformation episode but which intersect at an acute angle.

Convolute: describes irregular folds produced in soft sediments by slumping.

Crinoid: marine echinoderm with calcite-plated skeleton surrounded by soft tissue consisting of a stem and five free arms.

Cross-lamination; cross-bedding: inclined bedding with a relationship to the direction of current flow during deposition, cut across by subsequent bedding laminae deposited during different flow conditions.

Cupola: an upward projection of a large igneous intrusion beyond the general level of its roof.

Cyclothem: a sequence of beds which, although of different lithology, were all deposited during a single sedimentary cycle.

Décollement: plane of detachment, usually gently dipping or horizontal, which allows different styles of deformation to develop above and below; typically the basal sole structure in a thrust complex.

Detrital: relates to particles that have been part of a pre-existing rock.

Diagenesis: the processes affecting, or the changes imposed on, a sediment at low temperature and pressure prior to its deeper burial and lithification.

Distal: describes sedimentary lithologies deposited a long way from the source of the sediment (cf. proximal).

Dolerite: medium-grained basic igneous rock compositionally equivalent to basalt; usually occurs in larger intrusions where cooling has been relatively slow.

Dolomite: either the common rock forming mineral $\text{CaMg}(\text{CO}_3)_2$ or a sedimentary rock formed mainly of that mineral.

Downthrow: direction in, and/or distance by, which a rock unit is moved down across a fault.

Drumlin: mound of boulder clay elongated in the direction of ice flow.

Dyke: sheet-like, often vertical, igneous intrusion (cf. sill).

Esker: long, winding ridge of sand and gravel deposited by a subglacial stream or one issuing from a retreating glacier.

Euhedral: well-formed crystal shape (cf. subhedral).

Facies: general aspect of a suite of sedimentary rocks, from which its environment of deposition may be determined.

Fault: fracture in a rock along which there has been movement.

Feldsparphyric: an igneous rock texture in which large feldspar crystals are contained in a fine-grained groundmass.

Felsic: an acronym from feldspar and silica, used to describe pale-coloured rocks formed mainly of those minerals (cf. mafic).

Felsite: pale-coloured, fine-grained acid or intermediate igneous rock, often forming dykes.

Ferromagnesian: describes silicate minerals rich in iron and/or magnesium such as olivine, pyroxene, amphibole or biotite.

Fissile: breaks along closely spaced bedding planes.

Flame structure: feature produced when a layer of soft sediment is disrupted and forces its way upwards into an overlying layer, usually through loading, giving the appearance of flames.

Flute mark (cast): asymmetrical groove eroded in a sediment surface by a turbidity current, then filled with sediment and subsequently exhumed as a positive feature; a sole mark.

Flysch: general term for the sedimentary rock assemblage produced by deposition from turbidity currents.

Fold axis (= hinge): line joining the highest points within the axial plane of the same bed or layer in an antiform or the lowest points in a synform.

Forearc: in a volcanic arc formed above a subduction zone, that area between the arc and the adjacent trench.

Foreset: in a cross-bedded unit, one of the inclined layers deposited on an advancing frontal slope.

Gabbro: coarse-grained basic igneous rock compositionally equivalent to basalt and dolerite; forms in large intrusions where cooling has been very slow.

Gangue: that part of a mineral vein which is not the economically valuable material. Common gangue minerals are quartz and calcite.

Ganister: a hard, fine-grained quartz-rich sandstone or quartzite found as a seat earth to some coal seams.

Gouge: the soft, tectonically comminuted rock material found in some fault planes.

Graded bedding: unit of sedimentary rock which shows evidence of sorting with coarsest material at the base and finest material at the top.

Granite: coarse-grained acid igneous rock with quartz, sodium- and potassium-rich feldspars and micas; forms in large intrusions where cooling has been very slow.

Granodiorite: coarse-grained intermediate igneous rock compositionally equivalent to andesite and/or dacite with calcium-rich feldspar, hornblende and biotite; forms in large intrusions where cooling has been very slow.

Graptolite: colonial marine invertebrate, now extinct, which consisted of a branched organism with individuals living in 'cups' (thecae) along the branches.

Greywacke: matrix-rich sandstone with a mixed, angular clast assemblage including a high proportion of rock fragments.

Groove mark (cast): groove eroded in a sediment surface either by current flow or by an object being dragged along by the current, then filled with sediment and subsequently exhumed as a positive feature; a sole mark.

Half-graben: an extensional basin bounded on one side by a normal fault.

Hanging wall: the overlying side of an inclined fault; the underlying side is the footwall.

Hawaiite: a variety of olivine basalt containing andesine as the main plagioclase.

Hemipelagite: a sedimentary rock formed by the slow accumulation on the sea floor of biogenic and fine terrigenous particles.

Hinge zone: that part of a fold in the vicinity of the axial plane.

Hornfels: fine- to medium-grained rock produced by partial recrystallisation during thermal metamorphism.

Iapetus Ocean: former ocean between Scotland and England and the continental masses to which they were once attached; it developed and closed during the early Palaeozoic era.

Imbricate thrust: one of a series of thrusts whose dip decreases with depth towards a common basal sole thrust (cf. *décollement*)

Inlier: area of older rocks completely surrounded by younger rocks.

Intermediate: describes igneous rock containing less than 10 per cent quartz and having a chemical composition of between 55 and 66 per cent silica, SiO_2 (cf. acid, basic)

Intermontane: situated between or surrounded by mountains.

Isoclinal fold: fold in which the two limbs are approximately parallel.

Isocryst: a line on a metamorphic map joining points of equal low-grade metamorphism as quantified by white mica crystallinity.

Isotopic dating: see radiometric dating.

Lamprophyre: medium-grained basic and intermediate igneous rock with pyroxene, amphibole and/or biotite phenocrysts in a groundmass which also contains orthoclase and/or plagioclase. Commonly found as dykes or small

intrusive bodies.

Lapilli: a pyroclastic fragment in the size range 2 to 64 mm.

Leucocratic: describes igneous rocks containing mainly light-coloured minerals such as quartz, feldspar and muscovite.

Lithic: made of rock, as in a fragment or clast within a greywacke or conglomerate.

Lithoclast: an eroded and redeposited rock fragment larger than 2 mm in diameter.

Mafic: a general term used to describe the dark-coloured ferromagnesian minerals (pyroxenes, amphiboles etc.) or rocks composed principally of such minerals (cf. felsic).

Magma: molten rock derived from great depth within the Earth's crust or mantle, that solidifies to form an igneous rock, either as an extrusive lava or as an intrusion.

Melange: an internally chaotic body of rock in which clasts of various sizes and compositions are contained in a foliated, fine-grained matrix. May be produced by slumping of unlithified sediment or by tectonism.

Metabentonite: a lithified volcanic ash in which the clay minerals have mostly been altered to Wire.

Metamorphism: the alteration of rocks within the Earth's crust by heat and/or pressure.

Metasomatism: a metamorphic change which involves the introduction of material from an external source.

Microdiorite: medium-grained intermediate igneous rock, compositionally equivalent to andesite, with andesine plagioclase feldspar, some sodium or potassium feldspar and biotite, hornblende and augite, with minor amounts of quartz.

Monocline: asymmetric fold with one limb dipping steeply and the other dipping gently.

Mugearite: a variety of alkali-basalt usually containing oligoclase, olivine or clinopyroxene.

Mylonite: a fine-grained, banded rock produced by tectonic shearing and granulation of rocks that have been pulverised and rolled during thrusting or faulting.

Obduction: the overthrusting of oceanic crust on to the leading edge of a continental lithospheric plate.

Olistolith: an exotic rock fragment carried within a major submarine slump. The accumulation of such blocks in a fine-grained matrix is termed an olistostrome.

Oncolite: concentrically laminated ball produced by the action of algae in trapping sediment on the surface of a mobile grain.

Oolith: spherical particle, usually less than 2 mm diameter, formed by the concentric deposition of carbonate rings around a mobile grain.

Ophiolite: a group of mainly mafic and ultramafic igneous rocks with a common origin as oceanic crust. A relic 'stratigraphy' may be preserved with ultramafic rock at the base followed, in upward succession, by gabbro, a sheeted basalt dyke unit, and pillow lavas. There is often a cap of oceanic chert and shale.

Outlier: area of younger rocks completely surrounded by older rocks.

Palaeocurrent: ancient current from which sediment was deposited; its direction and flow-rate may be determined from sedimentary structures.

Palaeosol: a buried and lithified soil layer.

Pegmatite: an exceptionally coarse-grained igneous rock usually forming a dyke or vein.

Pelagic: (1) mode of life of animals which live permanently in the upper waters of the ocean, e.g. fish, jellyfish. (2) fine-grained sediment deposited on the deep ocean floor.

Pelite: metamorphosed argillaceous rock.

Pericline: fold in which variation in hinge plunge produces either a basin or a dome or an alternation of both.

Phenocryst: relatively large, usually well-formed crystal set in a groundmass of much smaller crystals.

Phyllonitic: a foliated texture formed by the mechanical degradation of initially coarser rocks.

Phyllosilicate: a class of minerals characterised by a sheet-like crystal structure. Mica is a typical example.

Pillow lava: a globular mass of lava extruded under water. As the semi-solidified pillows accumulate they flatten and sag into distinctive shapes that indicate the attitude of the original lava pile.

Plunge: direction and/or amount of downwards slope of a fold axis or lineation relative to the horizontal.

Pluton: large intrusion originally formed deep in the Earth's crust.

Porphyritic: texture in an igneous rock in which large crystals (phenocrysts) are set in a fine-grained groundmass.

Porphyroblast: a large crystal in a rock formed by metamorphic recrystallisation.

Porphyry: medium-grained acid or intermediate igneous rock containing phenocrysts usually of plagioclase feldspar.

Pressure shadow: aggregate of new grains growing on opposite sides of an original clast or crystal and producing an elongate structure; generally aligned parallel to a foliation.

Provenance: the source area from which the constituent grains in a sedimentary rock were originally derived.

Proximal: describes sedimentary lithologies deposited near to the source of the sediment (cf. distal).

Pseudomorph: a mineral produced by alteration which has assumed the crystal form of its precursor mineral.

Pyroclastic: describes a rock consisting of fragmental volcanic material blown into the air by an explosive volcanic eruption.

Radiolarian: single-celled marine planktonic protistan, secreting a lacy siliceous shell.

Radiometric dating: method for providing an age of a rock using radioactive decay rates.

Recumbent: describes an overturned fold in which both limbs and the axial plane are near horizontal.

Roche moutonnée: glacially smoothed rock with a gradual slope on the ice advance side and a steep, rough slope on the other side plucked by the ice.

Rodingite: a pale-coloured, fine-grained rock produced by the alteration of, and the addition of calcium to, an original basic igneous rock. The process is genetically associated with the conversion of ultramafic rock to serpentinite which may produce excess calcium (cf. metasomatism).

Rudite: a general name for clastic sedimentary rocks mainly composed of grains larger than sand size.

Scoria(-cious): lava full of empty vesicles.

Seatearth: fossil soil, commonly underlying a coal seam; palaeosol.

Shale: detrital sedimentary rock consisting predominantly of clay minerals and characterised by a marked bedding-plane fissility.

Sill: subhorizontal sheet-like igneous intrusion, often parallel to bedding.

Sinistral: left-lateral movement across a wrench fault (opposite is dextral).

Skarn: a thermally metamorphosed carbonate rock into which has been introduced additional silica, iron, aluminium and magnesium (cf. metasomatism).

Slickenfibres: Fibrous growths of quartz or calcite parallel to the direction of movement in a fault plane.

Slickensides: grooves produced by the fault movement of two rock surfaces against each other.

Sole mark: irregularity preserved on the base of a greywacke bed, e.g. flute mark and groove mark.

Spilite: basaltic rock containing albite as the plagioclase feldspar and chlorite replacing augite and olivine; generally found as submarine lava which reacted with sodium in the sea water.

Strike fault; strike-parallel fault: fault trending parallel to the regional strike of a layered sequence.

Strike-slip shear: lateral movement parallel to the regional strike along a strike fault.

Stromatolite: a layered structure produced by trapping and binding of sediment during the growth of algae; the forms produced may be sheets, domes or columns.

Subduction (-ing): where two continental or oceanic crustal plates move towards one another, the more dense plate sinks and moves below the other and consequently melts; the line of subduction is usually marked by a deep ocean trench and a linear volcanic belt often forms parallel to the margin of the overriding plate.

Subhedral: poorly formed crystal shape (cf. euhedral).

Syncline: usually convex-downwards fold with the youngest strata in the core (cf. anticline).

Thermal metamorphism: alteration of rocks by the action of heat alone, usually from an igneous intrusion.

Tholeiite: type of basalt containing calcium plagioclase and pigeonite, a pyroxene that forms on rapid cooling, with interstitial glass or intergrowths of quartz and alkali feldspar.

Thrust: gently or moderately dipping fault with a reverse sense of movement emplacing older rocks above younger; reversed fault.

Trace fossil: feature resulting from biological activity in sediment, e.g. footprint, burrow, trail.

Trachyte(-ic): fine-grained intermediate igneous rock dominated by lath-like plagioclase crystals, characteristically aligned during the flow of the original viscous lava.

Tuff: a general term for consolidated pyroclastic rocks consisting mainly of fine-grained fragments (cf. agglomerate).

Turbidity current: slurry of sediment that behaves as a fluid when it flows down an underwater slope; initially erosional, becomes depositional as current slackens.

Ultramafic: describes very dark igneous rocks composed principally of olivine and pyroxene minerals.

Unconformity: depositional surface above an angular break in bedding attitude; the beds above are approximately parallel to the depositional surface whereas the strata beneath may be at any attitude or even intensely folded.

Vent: volcanic pipe from which lava and ash are ejected; subsequently filled by solidified lava or volcanic agglomerate.

Vergence: (1) the direction of overturning in asymmetric or recumbent folds. (2) the direction in which a major anticline might be expected to exist, based on the geometry of a minor fold pair of anticline and syncline.

Vesicle(-cular): cavity in lava formed by gas bubbles (cf. amygdale).

Xenolith: inclusion of a fragment of older rock within an igneous rock.

Mineral table

Details of some of the more unusual minerals mentioned in the text.

Main groups

Amphiboles: Group of common rock-forming Mg-Fe silicate minerals widespread in igneous and metamorphic rocks.

Feldspars: Group of very important rock-forming silicates, the major constituent of igneous and metamorphic rocks and common as detrital grains in sedimentary rocks.

Garnets: Group of cubic Fe-Mg minerals found in many metamorphosed rocks, in some igneous rocks and commonly as detrital grains in sedimentary rocks.

Micas: Group of layer-lattice minerals consisting of sheets of silicates which produce a fine lamellar cleavage, occurring mainly in igneous and metamorphic rocks.

Pyroxenes: Group of rock-forming silicate minerals, with the general formula ZSi_2O_6 , where Z is most commonly Mg, Fe, Ca or Al; common in basic and ultrabasic igneous rocks.

Spinel: Group of cubic, oxide minerals with the general formulae XY_2O_4 where X may be Mg, Fe^{2+} , Mn or Zn; Y may be Al, Fe^{3+} or Cr; common accessory minerals in igneous rocks and as detrital grains in sedimentary rocks. Fe- and Cr-rich varieties are important as ore minerals.

Individual minerals

Actinolite: *amphibole group*. Calcium-rich Mg-Fe silicate occurring as a fibrous, pale green alteration product or in metamorphic rocks.

Apatite: calcium-rich phosphate mineral found in igneous rocks, usually white.

Arsenopyrite: sulphide ore mineral, $FeAsS$, usually found in veins, as aggregates, or as disseminations of silvery needles.

Azurite: secondary ore mineral, $2CuCO_3 \cdot Cu(OH)_2$, forms blue replacement masses after primary copper ore, usually associated with other oxidised Cu minerals.

Baryte: very heavy, massive or fibrous white mineral $BaSO_4$ found in veins; economically important.

Beudantite: greenish black secondary mineral, $PbFe_3(AsO_4)(SO_4)(OH)_6$, formed by the oxidation of primary lead ores such as galena in mixed sulphide mineral veins.

Biotite: *mica group*. Complex Fe-Mg layer lattice mineral, the iron-rich form of mica; brown in colour and common in igneous and metamorphic rocks.

Blende: zinc blende or sphalerite (ZnS), the principal ore of zinc.

Bornite: sulphide ore mineral, Cu_5FeS_4 , found as massive aggregates within hydrothermal copper veins; readily tarnishes on exposure to air.

Bournonite: mixed sulphide ore mineral, CuPbSbS_3 , dark grey and, through twinning, found as curious, wheel-shaped crystals; usually occurs with other copper minerals.

Chalcopyrite: sulphide ore mineral, CuFeS_2 , the main ore of copper; widely distributed in mineral veins and as brassy yellow disseminations in some igneous rocks.

Chlorite: one of a series of mainly green secondary minerals consisting of hydrated Mg-Al-Fe aluminium silicates, formed by the alteration of primary ferromagnesian minerals.

Cordierite: silicate mineral formed mainly during thermal metamorphism of argillaceous rocks. It occurs as ovoid crystals crowded with inclusions and often forms the spots in a hornfels.

Epidote: green, Ca-Fe silicate mineral most commonly formed during regional metamorphism or by the hydrothermal alteration of feldspar.

Galena: sulphide ore mineral, PbS , usually found as dense, black masses in hydrothermal mineral veins. The principal ore of lead.

Gersdorffite: silvery grey ore mineral, NiAsS , found in veins or as disseminations in basic and ultrabasic rock.

Gypsum: white to pink evaporite mineral, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, commonly forming nodules and layers within sedimentary sequences of tropical, shallow-marine origin.

Hemimorphite: secondary ore mineral, $\text{Zn}_4\text{Si}_3\text{O}_{10}(\text{OH})_2 \cdot \text{H}_2\text{O}$, a white alteration product found in the oxidised zones of zinc ore deposits or mineral veins.

Hornblende: *amphibole group*, black or green-black, complex Na- and K-rich, Fe-Mg silicate mineral, common in igneous and metamorphic rocks.

Jasper: red, haematite-rich variety of chert, the massive form of SiO_2 .

Linarite: rare, blue secondary mineral, $(\text{Pb}, \text{Cu})\text{SO}_4 \cdot (\text{Pb}, \text{Cu})(\text{OH})_2$, found as an oxidation product of primary ore in lead-copper veins.

Malachite: secondary ore mineral, $\text{Cu}_2\text{CO}_3(\text{OH})_2$; a bright green mineral seen as coatings and encrustations in the oxidised zone of copper deposits and on copper-rich rocks generally.

Molybdenite: sulphide ore mineral, MoS_2 , soft, silvery grey mineral forming plates or scales in hydrothermal veins and as disseminations in some igneous rocks.

Muscovite: *mica group*. complex K-Al layer-lattice mineral, the iron-free form of mica; colourless flakes very common in igneous and metamorphic rocks.

Nickeline: pale reddish brown mineral NiAs , usually found in hydrothermal veins. An important nickel ore.

Olivine: a series of mineral variations with the general formulae X_2SiO_4 where X is most commonly Fe, Mg or Mn or a combination of these; widespread in basic and ultrabasic igneous rocks, usually as the common form $(\text{Mg}, \text{Fe})_2(\text{SiO}_4)$.

Orthoclase: *feldspar group*. Potassium-rich variety KAlSi_3O_8 , with monoclinic crystal form; common in igneous rocks.

Pentlandite: sulphide ore mineral, $(\text{Fe, Ni})_9\text{S}_8$, usually found in hydrothermal veins or as disseminations in basic and ultrabasic igneous rocks.

Phlogopite: *mica group*. Complex K-MgFe layer lattice mineral similar to biotite but containing more magnesium; found in some basic and ultrabasic igneous rocks.

Pitchblende: a massive, impure variety of uranium oxide; radioactive.

Plagioclase: *feldspar group*. A series of feldspars forming a triclinic solid-solution series from pure sodium feldspar (albite, $\text{NaAlSi}_3\text{O}_8$) to pure calcium feldspar (anorthite, $\text{CaAl}_2\text{Si}_2\text{O}_8$). Plagioclase is the commonest component of igneous rocks.

Plumbogummite: complex secondary mineral, $\text{PbAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$, usually forming a brown alteration replacement of primary lead ore such as galena.

Pyromorphite: secondary ore mineral, $(\text{PbCl})\text{Pb}_4(\text{PO}_4)_3$, a greenish yellow encrustation on the primary ore minerals in the oxidised zone of lead deposits.

Pyrrhotite: sulphide ore mineral, Fe_7S_8 -FeS, a reddish bronze accessory disseminated in basic igneous rocks and concentrated as granular masses in hydrothermal veins.

Semseyite: dark grey or black mixed sulphide ore mineral, $\text{Pb}_9\text{Sb}_8\text{S}_{21}$ usually occurring in hydrothermal veins together with other lead and antimony minerals.

Sericite: intermediate between the micas and the clay minerals, usually an alteration product of other silicate minerals; common in weathered and slightly metamorphosed rocks.

Serpentine: green hydrated magnesium silicate mineral, $\text{Mg}_6\text{Si}_4\text{O}_{10}(\text{OH})_8$; massive or fibrous habit, formed by the alteration of olivine and some other ferromagnesian minerals in basic and ultrabasic rock.

Sillimanite: aluminium silicate mineral, Al_7SiO_5 , generally found as white needle-shaped crystals or fibrous aggregates in high-grade metamorphic rocks.

Sphalerite: sulphide ore mineral, ZnS, usually black or dark brown aggregates or masses in hydrothermal veins. The principal ore of zinc.

Stibnite: sulphide ore mineral, Sb_2S_3 ; forms silvery grey bladed crystals, usually in hydrothermal veins. The principal ore of antimony.

Tennantite: complex sulphide ore mineral $(\text{Cu,Fe})_{12}\text{As}_4\text{S}_{13}$, occurring as black, massive aggregates in veins. Forms a continuous series with tetrahedrite.

Tetrahedrite: complex sulphide ore mineral, $(\text{Cu,Fe})_{12}\text{Sb}_4\text{S}_{13}$, occurring as dark grey massive aggregates in hydrothermal veins, usually with copper minerals.

Tourmaline: complex boron-rich silicate mineral, very variable in colour and forming columnar crystals with unusual triangular cross-sections; associated with volatile, gaseous phases and found in some acid igneous rocks and high-grade metamorphic rocks.

Uraninite: black, massive, radioactive mineral, UO_2 , usually found in hydrothermal veins, granites and pegmatites.

Zircon: common accessory mineral, ZrSiO_4 , found in acid igneous rocks and as a resistate grain in sedimentary rocks derived therefrom.

