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Glossary

This list gives definitions of terms commonly encountered in geochemical studies of the subduction factory; some of these terms may be used differently in some types of crustal and mantle studies.

Anatectic melt: A kind of felsic melts produced by partial melting of crustal rocks, without spatial separation from the parental rocks.

Asthenospheric component: A geochemical component of depleted properties in mantle-derived rocks. With reference to the primitive mantle, it is normally depleted either in given trace elements or in their radiogenic isotopes. Generally, these trace elements refer to melt-mobile incompatible trace elements such as LILE and LREE, and the radiogenic isotopes refer to those such as Sr and Nd.

Asthenospheric mantle: The convecting portion of the upper mantle just below the oceanic and continental lithosphere. It is made of ultramafic rocks with a consistent composition. With respect to the primitive mantle, it is normally depleted not only in melt-mobile incompatible trace elements such as LILE and LREE but also in the radiogenic isotopes of these trace elements such as Sr and Nd.

Backarc basin basalts (BABB): Mafic volcanics that occur in backarc rift basins above oceanic subduction zones. They are geochemically heterogeneous and composed of two distinct parts similar to OAB and N-MORB, respectively.

Compatible element: An element that preferentially enters minerals during metamorphic dehydration, partial melting and fractional crystallization, with partition coefficients $D > 1$ between mineral and fluid/melt.

Coesite: A high pressure polymorph of quartz. It is produced at mantle depths of >80 km ($P > 2.8$ GPa) at 600°C, and thus used as a major index mineral for UHP metamorphism of subducted crustal rocks.

Continental arc andesites (CAA): A type of intermediate volcanics that occurs along continental margins above oceanic subduction zones. In a primitive mantle-normalized spidergram, these rocks exhibit enrichment of melt-mobile incompatible trace elements such as LILE, Pb and LREE but depletion of such HFSE as Nb and Ta.

Crustal component: A geochemical component of enriched properties in mantle-derived mafic to ultramafic rocks that exhibits enrichment of melt-mobile incompatible trace elements (LILE, Pb and LREE) and their radiogenic isotopes (Sr, Nd, Pb and Hf) with respect to the primitive mantle.

Crustal fluid: A fluid phase that is derived from dehydration of crustal rocks at elevated temperature and pressure during subduction-zone processes.

Crustal melt: A melt phase that is derived from partial melting of crustal rocks, with a spectrum of felsic compositions.

Crustal metasomatism: Addition of felsic components from subducted crustal rocks to the mantle domain at the slab-mantle interface in the subduction channel.

Depleted component: A geochemical component that exhibits depletion of melt-mobile incompatible trace elements and their radiogenic isotopes with respect to the primitive mantle. Generally, these trace elements include LILE and LREE, and the radiogenic isotopes refer to those such as Sr and Nd. For mantle peridotites, it is petrologically referred to depletion of basaltic components – principally major elements such as Ca, Al, Fe and Ti, but enrichment of refractory elements such as Mg in their constituent minerals (typically Fo93–95 for olivine).

Depleted mantle: An analogue to normal asthenopsheric mantle that is depleted in melt-mobile incompatible trace elements and their radiogenic isotopes with respect to the primitive mantle.

Diamond: A high pressure polymorph of graphite. It is produced at mantle depths of >120 km ($P > 3.3$ GPa), and can be used as an index mineral for UHP metamorphism of subducted crustal rocks.

Eclogite: A metamafic rock that is primarily composed of garnet and omphacite, with minor amounts of quartz/coesite, kyanite, phengite, zoisite, rutile and zircon but without plagioclase.

Enriched component: A geochemical component that exhibits enrichment of melt-mobile incompatible trace elements and their radiogenic isotopes with respect to the primitive mantle. Generally, these trace elements include LILE and LREE, and the radiogenic isotopes refer to those such as Sr, Nd, Pb and Hf.

Exhumation: The transport of subducted crustal rocks from the Earth's interior back to the surface along the plate's interface in subduction zones.

Fertile component: A basaltic component in mantle ultramafic rocks, principally consisting of the major elements Ca, Al, Fe and Ti. Fertile peridotites are low in MgO, typically with Fo86–90 for olivine from lherzolites of asthenospheric origin beneath mid-ocean ridges. However, fertile peridotites may be of metasomatic origin above subduction zones.

Garnet peridotite: An ultramafic rock that is primarily composed of garnet + olivine ± pyroxene. It commonly occurs in collisional orogens and thus is sometimes called orogenic peridotite.

High-pressure (HP) metamorphism: Metamorphic processes at pressures above the calcite to aragonite transition but still in the quartz stability field. HP metamorphic rocks occupy the blueschist,

amphibolite, HP eclogite and HP granulite facies.

Incompatible element: An element that preferentially enters fluid/melt during metamorphic dehydration, partial melting and fractional crystallization, with partition coefficients $D < 1$ between mineral and fluid/melt.

Leucosome: The part of a migmatite that is composed of newly crystallized minerals from anatectic melts.

Lithospheric mantle: The rigid portion of the upper mantle just above the asthenosphere. It primarily consists of ultramafic rocks that are regionally depleted but locally enriched in geochemistry and petrology. The suboceanic lithopsheric mantle is normally depleted not only in melt-mobile incompatible trace elements such as LILE, Pb and LREE but also in the radiogenic isotopes such as Sr and Nd. The subcontinental lithopsheric mantle (SCLM) is variably depleted in melt-mobile incompatible trace elements such as LILE, Pb and LREE but enriched in the radiogenic isotopes such as Sr and Nd.

Magmatic fluid: A fluid phase that originates from evolved magmas due to mineral crystallisation.

Magmatic melt: A melt phase that is evolved from anatectic melts that experience significant fractional crystallization with spatial separation from parental rocks.

Mantle fluid: A fluid phase that is derived from dehydration and melting of hydrous mantle domains. It may occur in the form of an aqueous solution or a supercritical fluid.

Mantle melt: A melt phase that is derived from partial melting of fertile mantle domains, forming a spectrum of mafic compositions.

Mantle metasomatism: Addition of mafic components from fertile mantle domains to the surrounding mantle.

Melanosome: The part of a migmatite that is mainly composed of refractory and peritectic minerals such as garnet, cordierite, biotite, amphibole or pyroxene.

Metamorphic facies: The collection of mineral parageneses from metamorphic rocks of all bulk compositions that form at given pressure and temperature conditions.

Metamorphic fluid: A fluid phase that is derived from dehydration of crustal rocks during metamorphism.

Metasome: A metasomatic rock in the mantle wedge due to reaction of the peridotite with felsic melts derived from partial melting of crustal rocks at the slab-mantle interface in subduction channel.

Mid-ocean ridge basalts (MORB): A type of mafic volcanics that occur along mid-ocean ridges. In a primitive mantle-normalized spidergram, these rocks are normally depleted in melt-mobile incompatible trace elements such as LILE, Pb and LREE but no depletion of such HFSE as Nb and Ta. They are also depleted in the radiogenic isotopes such as Sr, Nd, Pb and Hf.

Migmatite: An ultrametamorphic rock that formed by partial melting of crustal rocks. At the outcrop scale migmatites are heterogeneous and composed of two petrogenetically related parts called leucosome and melanosome.

Multiphase solid inclusions: A tight intergrowth of multiple minerals in a single morphological inclusion within metamorphic or magmatic minerals.

Oceanic arc basalts (OAB): A type of mafic volcanics that occur in the active margins of an oceanic plate above oceanic subduction zones. In a primitive mantle-normalized spidergram, these rocks generally exhibit enrichment of melt-mobile incompatible trace elements such as LILE, Pb and LREE but depletion of such as HFSE as Nb and Ta.

Oceanic island basalts (OIB): A type of mafic volcanics that occur in the interior of an oceanic plate without apparent relation to subduction zones. In a primitive mantle-normalized spidergram, these rocks generally exhibit enrichment of melt-mobile incompatible trace elements such as LILE and LREE, enrichment or no depletion of such HFSE as Nb and Ta, and depletion of Pb.

Orogenesis: The tectonic process of building an orogen at continental margins due to arc-continent or continent-continent collision.

Protolith: The parental rock from which metamorphic rocks are produced.

Restite: The refractory mineral assemblages during partial melting, left either in a migmatite or after melt extraction for magmatic rocks.

Stishovite: A very high pressure polymorph of quartz, formed by the conversion of coesite at mantle depths in excess of 200 km (~7 GPa) at 600°C or 300 km (~10 GPa) at 1400°C.

Subduction: The transport of a crustal slice from the Earth's surface to interior along plate's interface.

Subduction channel: A shear zone between the upper and lower plates of convergent plate margins during subduction and exhumation of crustal rocks. It has variable widths with free space, in which not only crustal fragments are detached from subducting slab but also mantle fragments are offscrapped from the bottom of the mantle wedge. This yields various types of tectonic mélanges at different pressures.

Terrane: A crustal block with a distinct lithotectonic composition. Exotic terranes are fault-bounded blocks that have a foreign origin compared to the surrounding rocks. Most UHP terranes are of known provenance and belong to parts of deeply subducted crustal blocks.

Ultrahigh-pressure (UHP) metamorphism: Metamorphic processes at pressures high enough to stabilize coesite (sometimes even diamond or stishovite). Thus, UHP metamorphism is identified by the presence of coesite or diamond, or by the determined pressure–temperature conditions deduced from the composition of peak metamorphic minerals.