Characteristics of olivine

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The mineral olivine (/'?l.??vi:n/) is a magnesium iron silicate with the chemical formula (Mg,Fe)2SiO4. It is a type of nesosilicate or orthosilicate. The primary component of the Earth"s upper mantle,[9] it is a common mineral in Earth"s subsurface, but weathers quickly on the surface. Olivine has many uses, such as the gemstone peridot (or chrysolite), as well as industrial applications like metalworking processes.

Olivine gives its name to the group of minerals with a related structure (the olivine group) - which includes tephroite (Mn2SiO4), monticellite (CaMgSiO4), larnite (Ca2SiO4) and kirschsteinite (CaFeSiO4) (commonly also spelled kirschteinite[10]).

Olivine"s crystal structure incorporates aspects of the orthorhombic P Bravais lattice, which arise from each silica (SiO4) unit being joined by metal divalent cations with each oxygen in SiO4 bound to three metal ions. It has a spinel-like structure similar to magnetite but uses one quadrivalent and two divalent cations M22+ M4+O4 instead of two trivalent and one divalent cations.[11]

Olivine is named for its typically olive-green color, thought to be a result of traces of nickel,[citation needed] though it may alter to a reddish color from the oxidation of iron.

Translucent olivine is sometimes used as a gemstone called peridot (p?ridot, the French word for olivine). It is also called chrysolite (or chrysolithe, from the Greek words for gold and stone), though this name is now rarely used in the English language. Some of the finest gem-quality olivine has been obtained from a body of mantle rocks on Zabargad Island in the Red Sea.[12][13]

Fe-rich olivine fayalite is relatively much less common, but it occurs in igneous rocks in small amounts in rare granites and rhyolites, and extremely Fe-rich olivine can exist stably with quartz and tridymite. In contrast, Mg-rich olivine does not occur stably with silica minerals, as it would react with them to form orthopyroxene ((Mg,Fe)2Si2O6).

Olivine pine forest (a plant community) is unique to Norway. It is rare and found on dry olivine ridges in the fjord districts of Sunnm?re and Nordfjord.[18]

Minerals in the olivine group crystallize in the orthorhombic system (space group Pbnm) with isolated silicate tetrahedra, meaning that olivine is a nesosilicate. The structure can be described as a hexagonal, close-packed array of oxygen ions with half of the octahedral sites occupied with magnesium or iron ions and one-eighth of the tetrahedral sites occupied by silicon ions.

There are three distinct oxygen sites (marked O1, O2 and O3 in figure 1), two distinct metal sites (M1 and M2) and only one distinct silicon site. O1, O2, M2 and Si all lie on mirror planes, while M1 exists on an

inversion center. O3 lies in a general position.

Hans Str?m in 1766 described the olivine"s typical red color on the surface and the blue color within. Str?m wrote that in Norddal district large quantities of olivine were broken from the bedrock and used as sharpening stones.[39]

The aluminium foundry industry uses olivine sand to cast objects in aluminium. Olivine sand requires less water than silica sands while still holding the mold together during handling and pouring of the metal. Less water means less gas (steam) to vent from the mold as metal is poured into the mold.[42]

In Finland, olivine is marketed as an ideal rock for sauna stoves because of its comparatively high density and resistance to weathering under repeated heating and cooling.[43]

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