

ILMENITE



A very common accessory mineral of mafic and ultramafic rocks. Ilmenite is also found in large segregations in ultramafic rock bodies, as megacrysts in kimberlite, in some high-temperature veins, and may be abundant as a heavy detrital species in sands and sandstones. Ilmenite is an abundant constituent of black sands, in seams as much as 5 to 8 centimeters thick, along south shore beaches of Lake Superior from Munising all the way west to Duluth, Minnesota. Nearly all Michigan kimberlites contain ilmenite or its Mg analog, geikielite (q.v.), and grains of ilmenite from these rocks have been recovered from till and gravel samples throughout the state. Small single crystals and polycrystalline aggregates up to 10 cm have been found. Only a few localities can be noted. Northern and Southern Peninsulas.

Dickinson County: 1. Metronite quarry, east of Felch: In aplite dike and in metasomatically altered Randville Dolomite (marble) with sulfides (Heinrich, 1962b). **2.** In kimberlites: General occurrence.

Genesee County: SW ¼ NW ¼ section 6, T8N, R7E: Found in glacial sand in a well as an accessory detrital species (Stewart, 1937).

Gratiot County: Near Ithaca, T10N, R2W in Michigan Basin Deep Drill Hole: As pyrogenic remnants altered largely to titanite and anatase in a relict albite – epidote – actinolite – chlorite – augite rock. Analyses are given by McCallister et al. (1978, Table 4). These ilmenites are characterized by relatively high Mn (~ 11 mole% pyrophanite). In contrast to ilmenites from kimberlites, they are very low in Mg.

Houghton and Keweenaw Counties: 1. Native copper district: Found in Keweenaw lavas as a) individual grains and crystals, b) partly altered to titanite, and c) intergrowths with hematite (Butler and Burbank, 1929; Cornwall, 1951a). **2.** Jacobsville Sandstone: As a heavy detrital species (Denning, 1949).

Iron County: 1. Lake Ellen kimberlite, SW ¼ section 27, T44N, R31W: Megacrysts averaging 1 to 1.5 cm typically show single grain nuclei surrounded by polygranular rims. All are highly

magnesian (12.54 to 19.10% MgO) with a wide range of Cr (0.35 to 1.52% Cr₂O₃). Associated ilmenite xenocrysts have similar compositions. Complete analyses are given by McGee and Hearn (1983). **2.** Camp 5 gravel pit, located just south of highway M-69 in SE ¼ SW ¼ section 36, T43N, R31W: Highly magnesian ilmenites with “leucoxene” coatings can be found in many of the kimberlite cobbles and boulders in the pit gravels (Carlson and Floodstrand, 1994).

Mackinac County: Unaltered and relatively unabraded magnesian ilmenite is present in many small streams near the Lake Michigan shoreline. These fresh grains suggest a proximal source (undiscovered kimberlite!) (S. M. Carlson, personal communication, 1995).

Marquette County: 1. Champion mine, 36th sublevel, about 135 meters east of Number 7 shaft: Reported by Babcock (1966a, b) from a vein with molybdenite and muscovite cutting massive magnetite ore. Ilmenite, sometimes partially altered to rutile, also occurs as small <5 mm laths in chlorite, garnet, and magnetite (Page, 1992). Many of the coarsely bladed, black, platy crystals in quartz collected from the dumps also have been called “ilmenite,” though when checked, usually prove to be hematite. **2.** The Yellow Dog peridotite, in sections 11 and 12, T50N, R29W, contains an accessory mineral assemblage of ilmenite, magnetite, rutile, chromite, and various sulfides (Klasner et al., 1979). Ilmenite, the most common opaque species, forms rounded-to-irregular skeletal grains as large as 2 mm, most interstitial to olivine (q.v.) and pyroxene (q.v.) grains. Some, however, are poikilitically enclosed in large pyroxene crystals. Grains of ilmenite commonly are fractured and show outlines suggestive of partial resorption. Most grains are optically homogenous, but some show exsolved, oriented lamellae {0001} of chromite(?) and titanomagnetite 1 to 3 mm wide. See pyrrhotite, pentlandite, and chalcopyrite. **3.** In a migmatite zone near Republic: Niobian ilmenite (Nb₂O₅ = 1 to 2%) occurs with brannerite and niobian anatase. **4.** Republic mine, Republic: With kutnohorite and altered diopside. Verified by X-ray diffraction (T. M. Bee, personal communication, 2000).

Menominee County: Site 73 kimberlite north of Hermansville: magnesian ilmenite from this

occurrence shows exsolution lamellae of hematite, which is unusual for ilmenite from a kimberlite (S. M. Carlson, written communication, 1997).

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