

# TIN MINERALS

## tin minerals

Tin, Sn, is one of the oldest known of the elements and has a crustal abundance of about 2.1 ppm. There are few economic tin minerals cassiterite and stannite are the most important.

The main producers are China, Malaysia, Indonesia, Thailand, Bolivia and Brazil. Global production is in excess of 140,000 tonnes per year. It has a large variety of uses and includes numerous alloys for solder, pewter, bronze, babbitt, dental amalgams and tinplate, also anti-fouling paints, coinage metals, super-conducting magnets, castings, ceramics, organ pipes, sensors and catalysts. A huge number of organometallic tin compounds were used in many industrial processes, but their use in some areas has fallen in recent years. Tin minerals are quite varied and most are found within assorted alloys, sulphides, oxides and in a few complex silicates.

**Tin** occurs as irregular rounded grains, pebbles and as aggregates of grains up to about 1.5 mm in size. Natural crystals are not known. The mineral is tin-white in colour with a metallic lustre and is ductile and malleable. The hardness is 2, the fracture is hackly and the specific gravity is high at 7.2. Tin is found in placer sands associated with platinum, iridosmine, gold, copper, cassiterite, corundum and calcite. The general rarity and chemistry are useful properties of tin. Many older listed localities have reported native tin in the past, but have later been shown to be man made in origin. A number of authenticated locations are known. These are the Nesbitt LaBine uranium mines, Saskatchewan, Canada; the Aberfoyle and Sam Rivers, New South Wales, Australia; the Elkiaidan river, Uzbekistan; Badiko district, Bauchi, Nigeria; the Rio Tamana, Cauca, Columbia; Viloco mine, La Paz, Bolivia and in the Ilimaussaq intrusion, Greenland.

Among the assorted tin alloys we have selected **taimyrite**,  $(Pd,Cu,Pt)_3Sn$ . It is an orthorhombic mineral that forms rounded grains up to about 0.5 mm across and as veinlets up to 12 mm in length. Most grains show polysynthetic twinning. It is commonly intergrown with silver, polarite, gold, and auricupride and is associated with chalcocopyrite, pentlandite, talnakhite, cubanite, magnetite, sperrylite, sobolevskite, galena, sphalerite and other species. The mineral occurs near contacts between sulphide and rock-forming minerals in gabbro-dolerites. It is bronze-grey in colour with a metallic lustre and a hardness of about 5. This mineral is weakly malleable and possesses a very high specific gravity of 11.6. The above properties and x-rays are used in its identification. A few localities are known for taimyrite: Talnakh deposit, Noril'sk-Talnakh, Taimyr, Siberia and at Oulanka Complex, northern Karelia, Russia; and at the Loolekop deposit, Gauteng, South Africa.

**Stannite**,  $Cu_2FeSnS_4$ , is steel-grey to iron-black in colour with an occasional tarnish. The mineral has an indistinct cleavage and an uneven fracture. The hardness is 4 and the specific gravity is moderately high and varies from 4.3 to 4.5. It has a blackish streak and is metallic. Stannite is tetragonal and forms pseudo-octahedral crystals that are twinned, and some exceptionally can reach 5 cm in size. More commonly it occurs as massive,



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granular and disseminated aggregates. It is a typically widespread hydrothermal species in tin-bearing deposits, and is frequently accompanied by chalcocopyrite, sphalerite, tetrahedrite, arsenopyrite, cassiterite, pyrite, wolframite, stannoidite, teallite and various sulphosalts. Careful study of its properties is needed since there are several very similar looking tin sulphide minerals. There are many localities for specimens and a few can be listed: Czech Republic, England, Germany, Russia, Bolivia, Australia, USA, Canada, China and Japan.

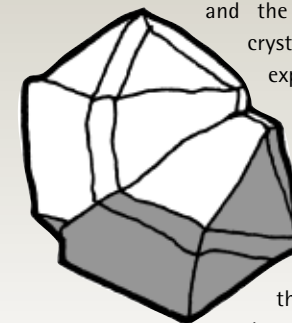
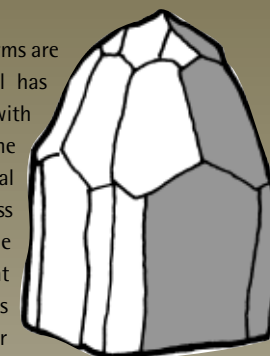


**Teallite**,  $PbSnS_2$ , occurs as a hydrothermal mineral found in tin veins, stratiform deposits and in burning coal dumps. It is usually found with cassiterite, sphalerite, wurtzite, galena, stannite, cylindrite, franckeite and pyrite. This mineral is greyish black and may tarnish or be iridescent. It is metallic with a black streak and has a perfect cleavage. Teallite is flexible and somewhat malleable with a low hardness of 1.5. The specific gravity is around 6.3. It occurs as massive aggregates of thin folia with irregular edges. Crystals are rare and are thin tabular in habit, with near square sections and striated lateral faces, and can also be warped or bent in character. The above characteristics along with its chemistry are used in its identification. Good samples come from many tin mines of Bolivia. It is also known from Smirnowsk and Sinantscha, Russia; Mt Bischoff, Tasmania, Australia; Radvanice, Czech Republic and at Ivigtut, southern Greenland.

**Cassiterite**,  $SnO_2$ , forms short to long pyramidal tetragonal crystals and is commonly terminated by steep pyramidal forms and can be acicular in habit. Twinning is frequent with contact and penetration types. Radial, fibrous, botryoidal, concretionary,

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massive and granular forms are abundant. The mineral has an imperfect cleavage with several partings and the fracture is subconchoidal to uneven. The hardness is between 5 and 6. The specific gravity is high at about 6.9. Cassiterite is transparent to near opaque. Colour ranges from black, brownish black, reddish brown, red, yellow, grey and is rarely white. The streak is white, pale brown to grey. It has an adamantine lustre and may be greasy on fractures. Distinguishing characteristics include the light streak, high specific gravity, high hardness and type of occurrence. It is the commonest tin mineral and occurs in medium to high-temperature hydrothermal veins and greisens, granitic pegmatites, rhyolites, occasionally in contact metamorphic deposits and large alluvial placers. Frequent associates are quartz, muscovite, wolframite, tourmalines, topaz, fluorite, scheelite, lepidolite, arsenopyrite, bismuth, molybdenite, tantalite, beryl and axinite group minerals. Occurrences for cassiterite are numerous and widespread, and only a selection can be cited: Cornwall, England, Germany, Czech Republic, France, Portugal, Russia, Nigeria, Namibia, Democratic Republic of Congo, Morocco, Indonesia, Malaysia, Afghanistan, Pakistan, Australia, China, Bolivia, Brazil, Mexico and the USA. Large nicely crystallised specimens are expensive especially those from classic locations such as Cornwall. Occasionally cut gems over one carat are made but are quite rare due to their persistent strong colour. Larger examples are known with typically dark brown shades.



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