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**Titanite**, or **sphene** (from the [Greek](/wiki/Greek_language) *sphenos* (σφηνώ), meaning wedge[[1]](#cite_note-1)), is a [calcium](/wiki/Calcium) [titanium](/wiki/Titanium) [nesosilicate](/wiki/Silicate_minerals) [mineral](/wiki/Mineral), [Ca](/wiki/Calcium)[Ti](/wiki/Titanium)[Si](/wiki/Silicon)[O](/wiki/Oxygen)5. Trace impurities of [iron](/wiki/Iron) and [aluminium](/wiki/Aluminium) are typically present. Also commonly present are [rare earth](/wiki/Rare_earth_element) metals including [cerium](/wiki/Cerium) and [yttrium](/wiki/Yttrium); [calcium](/wiki/Calcium) may be partly replaced by [thorium](/wiki/Thorium).[[2]](#cite_note-2)

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## Nomenclature[[edit](/index.php?title=(none)&action=edit&section=1)]

The [International Mineralogical Association](/wiki/International_Mineralogical_Association) Commission on New Minerals and Mineral Names (CNMMN) adopted the name titanite and 'discredited' the name sphene[[3]](#cite_note-3) as of 1982,[[4]](#cite_note-4) although commonly papers and books initially identify the mineral using both names.[[5]](#cite_note-5)[[6]](#cite_note-6) Sphene was the most commonly used name until the IMA decision, although both were well known.[[1]](#cite_note-1) Some authorities[[7]](#cite_note-7) think it is less confusing as the word is used to describe any chemical or crystal with [oxidized](/wiki/Oxide) titanium such as the [rare earth](/wiki/Rare_earth_element) titanate [pyrochlores](/wiki/Pyrochlore) series[[8]](#cite_note-8) and many of the minerals with the [perovskite structure](/wiki/Perovskite_(structure)).[[9]](#cite_note-9) The name sphene continues to be publishable in peer-reviewed scientific literature, e.g. a paper by Hayden et al. was published in early 2008 in the journal Contributions to Mineralogy and Petrology.[[7]](#cite_note-7) Sphene persists as the informal name for titanite [gemstones](/wiki/Gemstone).

## Physical properties[[edit](/index.php?title=(none)&action=edit&section=2)]

[thumb|left|Green titanite crystal cluster from the Tormiq Valley, Haramosh Mountains, Pakistan](/wiki/Image:Titanite_-_Tormiq_valley,_Haramosh_Mts,_Pakistan.jpg) Titanite, which is named for its titanium content, occurs as translucent to transparent, reddish brown, gray, yellow, green, or red [monoclinic](/wiki/Monoclinic) [crystals](/wiki/Crystal). These crystals are typically [sphenoid](/wiki/Sphenoid_(geometry)) in [habit](/wiki/Crystal_habit) and are often twinned. Possessing a subadamantine tending to slightly resinous [lustre](/wiki/Lustre_(mineralogy)), titanite has a [hardness](/wiki/Mohs_scale_of_mineral_hardness) of 5.5 and a weak [cleavage](/wiki/Cleavage_(crystal)). Its [specific gravity](/wiki/Specific_gravity) varies between 3.52 and 3.54. Titanite's [refractive index](/wiki/Refractive_index) is 1.885-1.990 to 1.915-2.050 with a strong [birefringence](/wiki/Birefringence) of 0.105 to 0.135 (biaxial positive) ; under the microscope this leads to a distinctive high relief which combined with the common yellow-brown colour and lozenge-shape cross-section makes the mineral easy to identify. Transparent specimens are noted for their strong [trichroism](/wiki/Pleochroism), the three colours presented being dependent on body colour. Owing to the [quenching](/wiki/Quenching_(fluorescence)) effect of iron, sphene exhibits no [fluorescence](/wiki/Fluorescence) under ultraviolet light. Some titanite has been found to be [metamict](/wiki/Metamictization), in consequence of structural damage due to radioactive decomposition of the often significant thorium content. When viewed in [thin section](/wiki/Thin_section) with a [petrographic microscope](/wiki/Petrographic_microscope), [pleochroic halos](/wiki/Pleochroic_halo) can be observed in minerals surrounding a titanite crystal.

## Occurrence[[edit](/index.php?title=(none)&action=edit&section=3)]

Titanite occurs as a common accessory mineral in intermediate and [felsic](/wiki/Felsic) [igneous rocks](/wiki/Igneous_rock) and associated [pegmatites](/wiki/Pegmatite). It also occurs in [metamorphic rocks](/wiki/Metamorphic_rock) such as [gneiss](/wiki/Gneiss) and [schists](/wiki/Schist) and [skarns](/wiki/Skarn).<ref name=Handbook/> Source localities include: Pakistan; Italy; Russia; China; Brazil; [Tujetsch](/wiki/Tujetsch), [St. Gothard](/wiki/Gotthard_Pass), Switzerland;[[1]](#cite_note-1) [Madagascar](/wiki/Madagascar); [Tyrol](/wiki/Tyrol_(state)), Austria; [Renfrew County, Ontario](/wiki/Renfrew_County,_Ontario), Canada; [Sanford](/wiki/Sanford,_Maine), [Maine](/wiki/Maine), [Gouverneur](/wiki/Gouverneur_(village),_New_York), [Diana](/wiki/Diana,_New_York), [Rossie](/wiki/Rossie,_New_York), [Fine](/wiki/Fine,_New_York), [Pitcairn](/wiki/Pitcairn,_New_York), [Brewster](/wiki/Brewster,_New_York), [New York](/wiki/New_York)[[1]](#cite_note-1) and [California](/wiki/California) in the US.

## Uses[[edit](/index.php?title=(none)&action=edit&section=4)]

Titanite is a source of [titanium dioxide](/wiki/Titanium_dioxide), TiO2, used in [pigments](/wiki/Pigment).

As a gemstone, titanite is usually some shade of chartreuse, but can be brown or black. Hue depends on Fe content, with low Fe content causing green and yellow colours, and high Fe content causing brown or black hues. Zoning is typical in titanite. It is prized for its exceptional [dispersive](/wiki/Dispersion_(optics)) power (0.051, B to G interval) which exceeds that of [diamond](/wiki/Diamond).[[10]](#cite_note-10) Jewelry use of titanite is limited, both because the stone is uncommon in gem quality and is relatively soft.

Titanite can also be used as a U-Pb geochronometer, specifically in metamorphic terranes.

## References[[edit](/index.php?title=(none)&action=edit&section=5)]

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