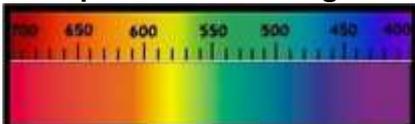


**Warning: this version has been completed with Google Translate , it certainly contains errors or inaccuracies.**

## Technical sheet - general: **E l b a i t e**

<b>Gemma - names</b>	( Italian - Elbaite) ( English - elbaite) ( French - elbaite) ( Spanish - elbaíta ) ( Portuguese - Elbaita ) ( Thai - เอลไบต์ Xelb i you)	( German - Elbait ) ( Arabic - الباييت albayt ) ( Russian - Эльбаит El'baít ) ( Mandarin - 埃尔拜特 Āi ěr bài tè ) ( Swahili - elbaite) ( Hindi - एल्बाइते elabait)	<p style="text-align: center;"><b>photo</b></p> 
<b>Colors (GIA)</b>	Virtually <b>every color of the rainbow</b> finds its mineral expression in elbaite. In addition, some specimens have a multicolored zoning. Elbaite <b>forms three series</b> , with dravite, with fluoro-liddicoatite and with schorl. Because of these series, the <b>samples with the ideal formula</b> of each simpleton / species <b>do not are found in nature</b> .		
<b>Cause of Color</b>	<p>Elbaite represents <b>most</b> of the tourmaline gems used in jewelry. It represents the third of the three types of tourmaline usually recognized, characterized by the predominance of some elements: iron tourmaline (schorl), black in color; tourmaline of magnesium (dravite), brown; and <b>alkaline tourmaline</b> , which can be pink (rubellite), green (verdelite) or colorless ( acroite ), blue (paraiba) or other colors. The chemical composition of elbaite contains a mixture of <b>calcium, chromium, fluorine, iron, lithium, manganese, magnesium, sodium, vanadium and rare traces of copper</b> , according to a general formula <b><math>WX_3Y_6B_3Si_6O_{27}(O, OH, F)_4</math></b> . <b>X</b> mainly corresponds (substitutes isomorphically) to lithium and aluminum (Li &amp; Al), <b>W</b> corresponds to nitrogen (Na), <b>Y</b> corresponds to aluminum, magnesium, iron, calcium (Al, Mg, Fe, Ca), etc. The trace elements that contribute to the various colors are:</p> <p><b>Green</b> (verdelite), Fe<sup>2+</sup> and Ti<sup>4+</sup> in octahedral coordination, the influence of various charge transfer processes involving iron is a real possibility. Yellow-green charge transfer, Mn<sup>2+</sup>-O-Ti<sup>4+</sup>.</p> <p><b>Greenish yellow</b> , Mn<sup>2+</sup> in octahedron coordination (rare).</p> <p><b>Orange, yellow , pink . red</b> , are related to manganese, generally due to Mn<sup>3+</sup> in octahedral coordination, sometimes caused by irradiation.</p> <p><b>Marrone</b> , _ transfer of charge, Fe<sup>2+</sup> ↔ Ti<sup>4+</sup></p> <p><b>Light blue, blue, blue-green</b> (paraiba), Cu<sup>2+</sup> copper , sometimes in combination with manganese (Mn<sup>2+</sup> and / or Mn<sup>3+</sup>). it adds charge transfers from iron to iron (Fe<sup>2+</sup>-Fe<sup>3+</sup>) which produce celestial blues and it can also be characterized by significant quantities of Lead (Pb<sup>2+</sup>, Pb<sup>4+</sup>) and Bismuth (Bi<sup>3+</sup>).</p> <p><b>Blue-indigo-violet</b> (paraiba or paraiba type): when the bivalent copper (Cu<sup>2+</sup>) is associated with impurities of trivalent manganese (Mn<sup>3+</sup>), violet, purple, pink (and sometimes even red shades are produced, depending on the concentrations trace elements).</p> <p><b>Blue</b> (indicolite): Fe<sup>2+</sup> in octahedral coordination with possible influence of some transfer processes linked to iron.</p> <p><b>Allochromatic Gem</b></p>		
<b>Classification</b>	<b>Mineral class</b> Complex borosilicate	<b>Species - Group (mineral)</b> Elbaite - Tourmaline	<b>Variety</b> various
<b>Optical properties</b>	<b>Specific Gravity:</b> 3.02-3.26 Common: 3.10	<b>RE:</b> 1,616-1,668 <b>Polariscope :</b> DR <b>Double refraction:</b> 0.014 to 0.032	<b>Character optical</b> Negative uniaxial <b>Pleochroism</b> <b>Strong dichroism</b> : it depends on the color and its intensity
	<b>Luster (luster) - luster of the fracture</b> Vitreous - vitreous		<b>Dispersion (fire)</b> 0.017-0.018
<b>Light</b>	<b>Fluorescence - varies by variety</b> <b>SWUV (254 nm)</b> : Weak blue-white <b>LWUV (365nm)</b> : Strong Blue, yellow,		<b>Phosphorescence</b> NA

<b>Form</b>	<b>Crystalline dress</b> Prismatic to acicular crystals <b>Melting point:</b> 1,050 -1,200 ° C	<b>Phenomenal optical effects</b> Attitude Asterism	<b>Crystalline system</b> Trigonal  <b>Crystal class</b>
<b>Chemical formula</b>	sodium, lithium, aluminum borosilicate  <b>( Li 1.5 Al 1.5 ) Al 6 Si 6 O 18 (BO 3 ) 3 ( OH ) 4</b> 4 or <b>Na ( Li, Al ) 3 Al 6 (BO 3 ) 3 Si 6 O 18 (OH) 4</b>	<b>Spectrometer image</b>  It depends on the variety	
<b>Fracture</b>	<b>Flaking</b> Indistinct (1 direction)	<b>Breaking- Parting</b> .	<b>Fracture</b> Sub-conchoidal, irregular
<b>Durability</b>	<b>Hardness (Mohs) - Absolute</b> 7-7.5; 100 - 150	<b>Toughness</b> Fragile	<b>Stability</b> (heat, light, chemicals) Very good
<b>Clarity - characteristics</b>	<b>Typical inclusions:</b> Liquid inclusions, growth fractures, imprints, tubes, trichites (capillaries or fine liquid tubes), highly reflective or iridescent inclusions.		
	<b>Type I.</b> Typically free of inclusions	<b>Transparency (commercial) - transparency</b> From transparent to opaque	
<b>Deposits - types of rocks</b>	<b>Elbaite</b> is formed in igneous and metamorphic rocks and veins in association with lepidolite, microcline and spodumene in <b>granite pegmatites</b> ; with andalusite and biotite in shale; and with molybdenite and cassiterite in massive hydrothermal replacement deposits. Because it is weather resistant, it accumulates in detrital deposits and is a common accessory mineral in sedimentary rocks. Important gem-quality pegmatites are found in the United States (Southern California and Maine), Brazil, Mozambique, and Madagascar. Elbaite is mined in different ways in different parts of the world and according to the type of source. Some sources are primary, which means that the crystals are extracted directly <b>from the vein or pegmatite</b> in which they originally formed. Others are alluvial sources, which means that the tourmaline crystals have been transported away from their original source by weathering and erosion. It arises in igneous and metamorphic rocks and veins in association with lepidolite, microcline and spodumene in granite pegmatites; with andalusite and biotite in shales; and with molybdenite and cassiterite in massive hydrothermal replacement deposits. <b>Geological age</b> : even 300-500 million years		
<b>Characteristics of rough stones</b>	Long crystals with triangular section and rounded sides, clear streak parallel to the main axis.		
<b>Main deposits</b>	<b>Brazil</b> (Paraiba, Minas Gerais) is the largest producer. High important deposits are found in: <b>Southwest Africa</b> , <b>Russia</b> (Ural Mountains), <b>Nigeria</b> (type-paraiba), <b>Mozambique</b> (type paraiba, verdelite, rubellite etc. Province of Nampula), <b>Zambia</b> , <b>Madagascar</b> , <b>Afghanistan</b> , <b>Malawi</b> , <b>Tanzania</b> , <b>Tajikistan</b> , <b>Sri Lanka</b> ( Sabaragamuwa Province ) , <b>Kenya</b> , <b>Pakistan</b> , <b>Myanmar</b> (Mandalay Region) .		
<b>Year of discovery</b>	<b>1914:</b> In 1914, the renowned Russian crystallographer, mineralogist, geochemist and geologist Vladimir Vernadsky proposed the name <b>Elbaite</b> for the lithium, sodium and aluminum-rich tourmaline from the Island of Elba, Italy. The original material was most likely recovered in Fonte del Prete, San Piero in Campo, Campo nell'Elba, Elba Island, Province of Livorno, Tuscany, Italy.		

## History

In the **16th century** , the Spanish conquistadors found green tourmaline (verdelite) in Brazil, which they believed was emerald. His mistake remained uncorrected for 300 years, when mineralogists correctly began to identify tourmaline as a mineral species in its own right.

In **the 17th century** , brightly colored Elbaite from Ceylon (now Sri Lanka) were brought to Europe, in large quantities, by the Dutch East India Company to meet a demand for gems.

**In the 19th century** , tourmalines were used by chemists to polarize light by shining rays on a cut and polished surface of these gemstones.

The alkaline element lithium (Li), essential in the composition of elbaite (lithium-tourmaline) was first determined in **1818** by Johan August Arfwedson , from studies done on three pegmatite minerals from Utö , Sweden. The Island of Elba, in Italy, was one of the first places where colored and colorless Elbaite were extensively analyzed chemically. In **1850** , Karl Friedrich August Rammelsberg first described fluorine (F) in tourmaline. In **1870** he proved that all tourmaline varieties contain chemically bound water. In **1889** Scharitzer proposed the replacement of (OH) with F in red Li-tourmaline from Sušice , in the Czech Republic. In **1892** , the gemologist George **F. Kunz** wrote a report on the discovery of elbaite deposits (not yet known by that name) in Maine and in California.

In **1933** the mineralogist Winchell published an updated formula for elbaite,  $H_8Na_2Li_3Al_3B_6Al_{12}SiO_{12}$  , which is still the basis for the modern classification of stone. The first determination of the crystal structure of a lithium-rich tourmaline was published in **1972** by Donnay and Barton .

**Since the early 1980s**, pegmatites in the Lundazi district of eastern **Zambia** have been known for producing **yellow elbaite** (as well as aquamarine, spessartine, green, pink and pink quartz tourmaline). gem quality was mined intermittently. This tourmaline is distinguished by its bright yellow.

A new discovery of gem-quality elbaite tourmalines that come in **unusually bright shades of green and blue** , among other colors, appeared on the international market in **1989** . Some colors were so exceptional that they were described as "neon", "fluorescent" or "electric" in the industry. This gem came to take the trade name of **Paraiba** , from the Brazilian state where it was first recovered. It was discovered in 1982 by Heitor Dimas Barbosa, along with an area miner named Jose Pereira, the two men explored numerous pegmatite deposits throughout the region for several months. Eventually, they spotted colored fragments in the named area in the village of Sao Jose da Batalha in the state of Paraiba in northeastern Brazil. In the following years, Barbosa and a team of about 15 *garimpeiros* (mining farmers) dug deep wells (up to 50m). Only in August 1987, however, did they encounter the characteristic "electric" and "sapphire" blue stones for which this deposit has become famous. In 1988 they set up the COGASBRA mining cooperative.

In **1994** , an important location was discovered in O'Grady in **Canada** Lakes in the Yukon .

**Name** : The name tourmaline derives from the Sinhalese word " *turmali* " which means *mixed and unidentified stones* .

**Elbaite** takes its name from the typical locality , **the island of Elba** , in Italy

**Other trade names:**

**Other varieties of elbaite:**

**Colorless** : acroite (from the Greek " ἀχρωμος " which means "colorless")

**Red or rosy-red** : Rubellite (from ruby)

**Light blue to bluish green** : **Brazilian** indicolite (from indigo)

**Green** : Brazilian verdelite (from emerald)

**watermelon / watermelon** tourmaline is a zoned variety with a reddish center surrounded by a green outer zone reminiscent of watermelon peel, evident in slices of cross-sectional prisms, often showing curved sides.

**Azure-green-blue** : Paraiba, when the color is due to copper.

**Azure-blue-green** : indicolite, when the color is due to iron.

**Variety:**

**Rubellite**

An elbaite with a dark pink, orange-pink, red , pink-red, red-purple color due to the presence of manganese,  $Mn^{3+}$  ). Excellent jewelry stone and ruby red specimens with no orange or brown undertones are highly prized.

**Indicolite**

	<p>Blue-green Elbaite (dark blue ones are also very rare) whose color is caused by iron (Fe<sup>2+</sup>).</p> <p><b>Watermelon tourmaline</b>  <b>pink and green Elbaite</b> crystals are found in the same stone and these color zones provide a visual record of its formation process.</p> <p><b>Tourmaline Sea foam</b>  When iron impurities are present which produce predominantly blue shades (Fe<sup>2+</sup> / Fe<sup>2+</sup>-Fe<sup>3+</sup>) with small amounts of charge transfer from iron to titanium (Fe<sup>2+</sup>-Ti<sup>4+</sup>), tourmaline may show colors brilliant blue-green. These gems come mainly from the Alto Ligonha region, Zambezia province, Mozambique.</p> <p><b>Olive Tourmaline and Lime Tourmaline</b>  thormaline (verdelite) with significant manganese impurities responsible for the yellow color. This blend can give the stones colors ranging from olive / leaf green to bright lime green.</p> <p><b>Canary tourmaline</b>  Elbaite of bright yellow color, caused by a mixture of impurities associated with the yellow color (Mn<sup>2+</sup> / Mn<sup>2+</sup>-Ti<sup>4+</sup>).</p> <p><b>Mint tourmaline</b>  With a range of bright green shades that between olive green and blue-green that can resemble chromed tourmaline (whose color comes from chromium, Cr<sup>3+</sup>). Yellowish mint greens can be produced from a mixture of the impurities associated with the yellow color of elbaite (Mn<sup>2+</sup> / Mn<sup>2+</sup>-Ti<sup>4+</sup>) and the impurities responsible for verdelite green (Fe<sup>2+</sup> / Fe<sup>2+</sup>-Ti<sup>4+</sup>), while bluish mint greens are produced from a mixture of verdelite impurities (Fe<sup>2+</sup> / Fe<sup>2+</sup>-Ti<sup>4+</sup>) and iron impurities responsible for indicolite blue (Fe<sup>2+</sup> / Fe<sup>2+</sup>-Fe<sup>3+</sup>).</p> <p><b>Sunset Tourmaline and Orange Tourmaline</b>  Elbaite can show orange colors when both the impurities responsible for the red of the rubellite and the impurities responsible for the yellow of the canary tourmaline are present. The intensity of the orange color is often faint and / or irregular (sunset tourmaline), but in very rare cases, it can be vivid (orange tourmaline).</p> <p><b>Two-tone tourmaline</b>  Elbaite divided into 2 colors, whose demarcation is well discernible.</p> <p><b>Tricolor tourmaline</b>  Elbaite divided into 3 colors, whose demarcation is well discernible.</p> <p><b>Multicolored Elbaite</b>  Elbaite divided into various colors, whose demarcation is not always well discernible.</p> <p><b>Siberian tourmaline</b>  Violet and purple are very rare colors to display in a tourmaline, but the right blend of trace impurities can produce these hues. When iron, responsible for the blue of indicolite, is accompanied by manganese, due to the red of rubellite, a purple / violet tint can arise in the necessary quantities. Vivid-toned stones are known as <b>Siberite</b> or <i>Siberian tourmaline</i> in reference to the Russian region from which the first purple elbaite crystals came.</p> <p><b>Cupriana Tourmaline (and Paraíba Tourmaline)</b>  The most sought after variety of elbaite is colored by traces of bivalent copper impurities sometimes in combination with manganese. These stones can exhibit a number of different colors depending on the ratio of the impurities present. They can range from intense neon blue (copper), to aqua blue and neon green (iron-to-iron charge transfers that produce celestial blues); when copper is present along with manganese, it can produce violets, pinks and reds.</p>
<p><b>Property attributed</b></p>	<p>An Egyptian legend has it that tourmaline found its famous range of colors when, on its journey from the center of the earth, it passed through a rainbow. Because of its colors, tourmaline was, especially in the past, confused with other gems.</p> <p>Tourmaline (in general) was declared <b>the stone of the Muses</b>, referring to the potential to inspire and enrich people's creative processes. It is sometimes worn as a talisman by actors, artists and writers. Its pyroelectric and piezoelectric properties are said to aid <b>in the amplification of psychic energy and dissipate negative energies</b>.</p> <p>Elbaite is considered a very positive crystal that strengthens during all trials of one's life. It has balancing properties that help to move away from extremes and into fairer emotional and intellectual perspectives.</p> <p>Elbaite brings <b>strength, courage and conviction</b> to endeavors based <b>on love</b>. Especially in abusive relationships and negative work situations. It also prompts you to recognize</p>

	<p>why these problems arise in your life, providing emotional support for the <b>transition period</b> in which you are learning to live free from these destructive patterns that no longer serve. Tourmaline (of each color) is the official October birthstone adopted by the American National Association of Jewelers in <b>1912</b> and is the accepted gem for <b>the 8th wedding anniversary</b> .</p> <p><b>Planet:</b>  <b>Month:</b> October <b>Zodiac sign:</b> Gemini  <b>Chakra:</b> Root and Heart</p>		
<b>Treatments</b>	<p>The paraiba often undergoes interventions with heating to change its color. Indicolite, on the other hand, is thermally treated to lighten its color.</p>		
<b>Synthetic counterpart</b>	<p>Contrary to common tourmaline, most attempts to synthesize elbaite have failed. However, today there is a synthetic counterpart of elbaite which typically exhibits a strong iron content (Fe<sup>3+</sup>). In 2010-11 aluminous tourmaline was synthesized containing 37% by moles of the Elbaite component. There was already the potential of these lab-made crystals to enter the gem market. However, there is no news of this event.</p>		
<b>It can be confused with</b>	<p><b>Peridot</b> (separation by: RI, SG birefringence), <b>Andalusite</b> (separation by: optical figure, pleochroism, birefringence), <b>Apatite</b> (separation by: hardness, birefringence, spectrum), <b>Danburite</b> (separation by: optical figure, RI, birefringence, pleochroism) , <b>Iolite</b> (separation by: pleochroism, optical figure, RI, SG), <b>Heliodorus, Morganite and other Beryls</b> (separation by: RI, birefringence, SG, pleochroism), <b>Citrine</b> (RI, SG, pleochroism), <b>Tsavorite</b> (separation by: character optical), <b>Chromed diopside</b> (separation by: optical figure, RI, birefringence, SG), <b>Red</b> or other colored spinel (separation by: RI, optical character), <b>Topaz</b> (separation by: RI, SG birefringence), <b>Aquamarine</b> (separation by : RI, SG, inclusions).</p>		
<b>Indicative gemological tests</b>	<p>Standard gemological tests are sufficient for quick identification. The combination of birefringence and refractive index provide a good indication and, when the color is sufficiently intense, also the strong pleochroism.</p> <p>The common gemological examinations can be accompanied, for particular needs, by specific tests: elbaite is <b>pyroelectric</b> , that is, it develops an electric charge when heated and <b>piezoelectric</b> , that is, it develops an electric charge when the pressure is applied parallel to the direction of the <b>C axis</b> .</p>		
<b>Value (2021)</b>	<p><b>High</b> : \$ / ct  <b>Paraiba (Brazilian): 20-30,000 +</b>  <b>Rubellite: 650+</b>  <b>Indicolite: 150+</b>  <b>Verdelite: 50+</b>  <b>Watermelon: 750</b>  <b>3 carat +</b></p>	<p><b>Average:</b> \$ / ct  <b>Paraiba: 5,000</b>  <b>Rubellite: 300</b>  <b>Indicolite: 100</b>  <b>Verdelite: 20</b>  <b>Watermelon: 300</b>  <b>1-3 carats</b></p>	<p><b>Low:</b> \$ / ct  <b>Paraiba: 1,000</b>  <b>Rubellite: 25+</b>  <b>Indicolite: 25+</b>  <b>Verdelite: 5</b>  <b>Watermelon: 75</b>  <b>below the carat</b></p>
<b>Typical cut</b>	<p>Tourmalines (of various colors) can be cut in many ways, but they require special care, since the intensity of the color of most of these gems is variously developed <b>depending on the direction of growth</b> . For this reason, the dark stones must be faceted in such a way that the board is parallel to the main axis. With light stones, however, the table top should be perpendicular to the longitudinal axis, in order to receive more depth of color. Given the good durability (hardness, toughness and stability) the gem finds ample space in all types of jewels. Of particular interest is the "paraiba" variety (cupric elbaite) given its value per carat side.</p>		
<b>Famous stones</b>	<p>The "<b>Candelabra</b>" is an elbaite tourmaline specimen found in Pala, California. Its banded color, caused by a change in the growth solution from rich in manganese and iron, results in a blue cap over each pink tourmaline "candle".</p> <p>The "<b>Steamboat</b>" <b>tourmaline</b> exhibited at the Smithsonian Museum, Washington, USA, is an extraordinary example of elbaite mineral. It consists of two parallel crystals, which resemble stacks of steamships and display a range of vibrant colors starting with a vivid reddish pink at the bottom and changing to a bright bluish green at the top. This gem was recovered around 1907.</p>		
<b>Record stones</b>	<p>In 1904, the largest world record of elbaite crystal, over 50cm in length, was held by the Monte Mica quarry in the USA. This record was beaten in <b>1978</b> from "<b>Tarugo</b>", (meaning short, fat and ugly man) a purple-red tourmaline crystal measuring <b>85 cm and weighing 82 kg</b> found in the Jonas mine in Minas Gerais, Brazil. In 2016, the crystal was placed for sale and was bought by Richard Freeman and James Elliott.</p>		