

# Gemstones of Gemmological value

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(Post graduate Diploma in Gemmology.)

Gems are minerals. Due to several chemical and physical activities minerals are formed in the earth.

Sri Lanka is famous for gems all over the world. During ancient times Ceylon (Sri Lanka) named as “Gem Island” (Rathnadeepa)

Gems are found all over the county of Sri Lanka except maocene layer in the northerrn region. Avissawella, Balangoda, Akuressa area called gem triangle, where most of the gem mines are located.

For easy categorization in trading the terms precious and Semi precious are used. But at present semi precious gem stones fetch higher prices.(Ex: Tsavorite-the green variety of Garnet, due high demand )

Gems are rare but the even rarer. Gems are classified as rare gems and they are lesser known. These rare gem stones are mainly bought by gem and mineral collectors.

## Apatite

Hardness- 5 (Moh’s scale)

Specific Gravity- 3.2

Refractive index- 1.63-1.64

D.R.-0.003

Crystal system- Hexagonal

Chemical compositions-(  $\text{Ca}_5\text{PO}_4)_3$  (F,OH,Cl)

Transparency - Transparent

Colour –Yellow,Green,Blue,Purple

Pink is due to Vanadium

Dark blue –  $\text{O}^{2-} \longrightarrow \text{Mn}^{5+}$

Spectrum- Several sharp lines in the yellow region

This is due to rare earth elements (Didymium-Neodymium and Praseodymium)

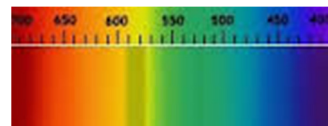
Inclusions-healing cracks ,hollow tubes.

Apatite can be easily confused with other gems.,In Greek the word cheat is Apatite.It named as Apatite.The green variety of apatite called as “Asparagus stone”

Occurrence-Madagascar, India, Kenya, Mexico, Sri Lanka, South Africa, U.S.A.



Apatite



## Andalusite

Hardness - 7½ (Moh's scale)

Specific Gravity - 3.18

R.I - 1.629-1.649

D.R- 0.007-0.013

Crystal System-orthorhombic

Chemical compositions-  $\text{Al}_2\text{SiO}_5$

Pleochroism- Strong.Can be seen with the naked eye.

Colour- Brown, Green,Pink colourless, Yellowish green

Colour is due to  $\text{Fe}^{2+}$  -O-  $\text{Ti}^{++}$  charge transfer

Chiasolite-opaque varitey of Andalusite.

Dark green(Verdine) - Colour is due to  $\text{Mn}^{3+}$  in octahexagonal coordination

Inclusions- Needle like Crystals, Liquid inclusions.

Spectrum – lines in the green and blue region. Bands at 553nm,550nm,547nm,520nm,495nm,455nm.

Andalusite first found in Andalusia(Spain)and named as Andalusite.

Occurrence- Australia, Brazil, Russia, Spain(Andalusia)Sri Lanka, USA.



Andalusite



## Axinite

Hardness - 7 (show directional hardness)

Specific Gravity - 3.27 – 3.36

R.I - 1.675- 1.685

D.R- 0.010- 0.12

Chemical compositions-  $(\text{CaFeMgMn})_3 \text{AlBSi}_4\text{O}_{15}(\text{OH})$

Crystal System- Trigonal

Spectrum – Bands at 512nm- 492nm

Lustre- Strong vitreous

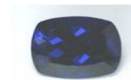
Colour - Blue, Brown

Blue is due to Vanadium( $\text{V}^+$  in octahedral coordination )

Brown due to  $\text{Fe}^{2+}$

The crystals of axinite are very sharp as axes.The Greek word for axe is Axinite.The mineral named as Axinite.It has pyro and piezo electricity .It attracts dust particals and must be cleaned frequently.

Occurrence-Brazil, England, France, Mexico, Russia, Sri Lanka, Tanzania.



## **Diopside**

Hardness- 6 (Moh's scale)

Specific Gravity- 3.24-3.33

Refractive index- 1.668-1.698

D.R.- 0.025

Transparency - Transparent .There are translucent stones with cat's eye effect and asteriated.

Crystal system-Monoclinic

Lustre -Vitreous

Colour – Yellow,Green,Brown,Colourless,Blackish

Chemical compositions- $\text{CaMg}(\text{SiO}_3)_2$

Inclusions – Magnetite, Healing Cracks, Liquid inclusions.

Because of the crystal shape(double appeared) it name as named as Diopside (the Greek word for double appearance)

Chrome Dopside-Emerald green variety of Diopside

Violane-Violetish blue variety,Translucent to opaque

Occurrence-Burma, Myanmar, Finland, India, Austria, Madagascar, Sri Lanka, South Africa, U.S.A



**Diopside**

## **Dunilite**

Hardness- 6 ½(According to Moh's Scale)

Specific Gravity- 3.48

Refractive index- 1.677-1.718

D.R.-0.041

Transparency - Transparent

Colour – Rough dark grayish green (Feceted- Greenish Yellow)

Pleochorism- Strong (Brownish Yellow/Greenish Yellow)

Crystal system- Orthorhombic

Absorption Spectrum- 3 bands between 500nm & 450 nm

Inclusions- Hercynite Crystals, Liquid feathers, negative crystals.

## **Dumotierite**

Hardness- 7-7½ (Moh' Scale)

R.I - 1.669 – 1.723

Specific Gravity – 3.31

D.R- 0.015-0.037

Chemical compositions- $Al_7(BO_3)(SiO_4)3O_3$

Crystal System-orthorhombic

Colour-Violet,Reddish brown,blue,Green,Brown.

Pleochroism- Strong.

Dumotierite named after french scientist M.E.Dumortier.It a decorative stone.Found very small crystals less than 1mm.Dumotierite intergrown with colourless quartz.(Dumotierite Quartz)

Occurrence – Nevada (USA),France, Madagascar, Norway ,Sri Lanka, Canada, Poland, Namibia.

## **Ekanite**

Hardness- 4 ½ - 6 ½ (Moh's scale)

Refractive index- 1.572 – 1.573

D.R.-0.001

Specific Gravity.-3.28

Transparency - Transparent to Translucent

Colour –Dark Green, Yellow, Brown)

Crystal system- Originally it's Tetragonal but later become amorphous

Chemical compositions-  $Ca_2Th(Si_8O_{20})$

A Sri Lankan named F.L.D. Ekanayake Sri Lanka Customs Gemmologist discovered this gem in 1953. In honour of him,that the gem named as Ekanite.. Ekanite is high radioactive because of Thorium. When handle it gemologists must take care. There are some stones with asterism(Four rayed stars)



Ekanite

## **Enstatite**

Hardness - 5-6 (Moh's scale)

R.I - 1.652-1.680

S.G - 3.23-3.28

D.R- 0.010

Optic sign- B<sup>+</sup>

Chemical composition- Mg<sub>2</sub>Si<sub>2</sub>O<sub>6</sub>

Crystal System-orthorhombic

Colour – Gray,Green,Dark yellow, Yellowish brown,Brown,Greenish brown.

Colour is due to Fe<sup>2+</sup> in greenish brown stones and Fe<sup>2+</sup> with Cr<sup>3+</sup> in green stones.

Pleochroism - Strong in brown stones.Weak in green stones

Spectrum- A sharp line in the green region at 506nm.

Resistor in Greek is Enstatite.The gem named as Enstatite because it does not melt easily.(resists)

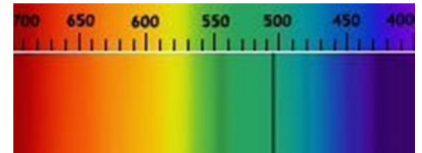
Bronzite-Green and brown variety

There are stones with cat's eye effect and star effect (4 and 6 six rayed)

Occurrence-Burma, Brazil, India, Kenya, Mexico, Sri Lanka, South Africa, Tanzania.



Enstatite



## **Iolite (Cordierite)**

Hardness - 7-7½ ( Moh's scale)

R.I - 1.530-1.540

Specific Gravity – 2.57

D.R- 0.008-0.012

Chemical compositions- (MgFe)<sub>2</sub> (Al<sub>4</sub>Si<sub>5</sub>O<sub>18</sub>)

Colour – Violet,Blue,Red(Blood shot iolite)

Colour is due to Fe<sup>2+</sup> -o- Fe<sup>3+</sup> charge transfer –( in violet and blue stones.) Due to hematite and lapidocrocite inclusions in red stones.

Inclusions – Hemtite and goethite flakes.

Pleochorism – Highly Pleochroic. Blue varitey show Blue/Violetish Blue/Straw Yellow.

The Greek word for the colour violet is Iolite.Then the gem named as Iolite.

In Sri Lanka Iolite is famous as “Weligama Blue”, since Iolite ealier found from weligama area.

Occurrence –Brazil, India, Madagascar, Myanmar, Sri Lanka.



## Kornerupine

Hardness - 6½ (Moh' scale)

R.I - 1.665-1.688

Specific Gravity – 3.25

D.R- 0.013-0.014

Chemical compositions- $Mg_3Al_6(SiAlB)_5O_{21}$

Crystal System-orthorhombic

Colour – Green, Bluish green, Brownish green, Greenish brown.

Pleochorism- Strong.Green/Yellow/Reddish Brown

Transparency- transparent, Translucent stones with asterism and chatoyancy

Inclusions- needle like crystals, Zircon haloes.

Kornerupine named after Danish geologist who explore Greenland

Occurrence- Burma, Canada, Kenya, Madagascar, Sri lanka, Tanzania, South Africa.



Kornerupine

## Sinhalite

Hardness - 6-7 (Moh's scale)

R.I - 1.669-1.707

Specific Gravity - 3.47

D.R- 0.038

Chemical compositions-  $MgAlBO_4$

Crystal System-orthorhombic

Spectrum- Lines at 453nm,463nm,473nm, and 493

Inclusions- Needle like inclusions, fibrous crystals

First found in Srilanka(Ceylon) in 1952.Sanskrit name for

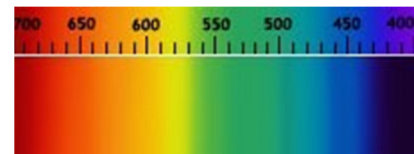
Ceylon is "Sinbala" So it named as Sinhalite Sinhalite confused with peridot. But can be identified

examining the spectrum. Peridot has three bands in the blue regions of the spectrum. Sinhalite shows an additional band.

Occurrence – Burma, Russia, Sri Lanka, Tanzania.



Sinhalite



## Scapolite

Hardness- 5-6½( Moh's scale)

R.I - 1.531-1.600

Specific Gravity – 3.25

D.R- 0.004-0.026

Chemical compositions-Marialite- $\text{Na}_4\text{Al}_3\text{SiO}_{24}\text{Cl}$

Mejonite- $\text{Ca}_4\text{Al}_6\text{Si}_6\text{O}_{24}(\text{CO}_3, \text{SO}_4)$



Scapolite

Crystal System-Tetragonal

Transparency- transparent to Translucent. Translucent stones show Cat's eye effect.

Petsesite –Violet variety of Scapolite

Inclusions- Hollow tubes, Needle like crystals

It has stick like crystal habit .(In Greek stick is Scapolite)

Occurrence – Brazil. Canada, Madagascar, Sri Lanka.

## Serandibite

Hardness - 6 ½ (moh' Scale)

Specific Gravity - 3.44

R.I - 1.697- 1.702

D.R- 0.005

Optic Sign - Biaxial

Pleochroism - Strong(Light yellowish green/Bluish green/Violetish Blue)

Transparency- Transparent

Chemical compositions-  $(\text{CaNa})_2 (\text{Al}, \text{Mg}, \text{Fe}^{2+}\text{Fe}^{3+})_6 (\text{Si}, \text{B}, \text{Al})_6 \text{O}_{20}$

Crystal System- Triclinic

Absorption Spectrum – One weak line at 470nm.

Under U.V .Light- it's Inert

Inclusions -Poly Synthetic Twinning, Minerals & White finger print inclusions

Serandibite mineral was first found in 1903 in Sri Lanka The name Serandibite was derived from "Serandib" the old Arabic name for Sri Lanka. In 1997 ,gem quality Serandibite found from secondary gem deposit, at Kollonne Sri Lanka.

(Discoverer – D.P.Gunasekera former Gemologist of State Gem Corporation)

## **Sillimanite (Fibrolite)**

Hardness-  $7\frac{1}{2}$  (Moh's scale)

R.I - 1.655 – 1.684

Specific Gravity – 3.25

D.R- 0.014-0.021

Chemical compositions-  $Al_2SiO_5$

Colour-Colourless,Blue,Green,Grayish green,Brown

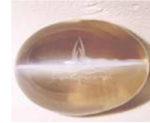
Pleochrism-Strong.Pale Yellowish green/Dark green/Blue

Inclusions- Fine needle like crystals.

Stones with chatoyancy can be found.

Sillimanite named after professor Sillimon.

Occurrence-Found in Metamorphic rock. Violet and Blue Stones are from Burma, Greenish Gray stones from Sri Lanka, India, Italy, Brazil



## **Taaffeite**

Hardness-  $8-8\frac{1}{2}$  (Moh's scale)

Specific Gravity- 3.60

Refractive index- 1.718-1.772

D.R.- 0.004

Transparency - Transparent

Crystal system-Hexagonal

Elusive -Vitreous

Colour – Red, Green, Bluish, Violet, Colourless)

Chemical compositions- $Mg_3A_{18}BeO_{16}$

Inclusions - Healing cracks and crystal inclusions.

Because of the close value of R.I and appearance, to Spinel it always mislead. But this is doubly refractive and Spinel is singly refractive.

The name Taaffeite given in honour of Edward Taaffe who discovered this gem in 1945.



Taaffeite

## **Tsvorite(Green grossular garnet)**

Hardness- $7\frac{1}{2}$  (Moh's scale)

R.I - 1.740 to 1.750

Specific Gravity – 3.69

Chemical compositions- $Ca_3Al_2(SiO_4)_3$

Crystal System-Cubic

Colour-Bright bluish green to Yellowish green.

The name grossular derived from the botanical name for goose berry.(grossularite)

First found in metamorphic rock in Tsvor(Kenya)

Occurrence-Canada, Sri Lanka, Pakistan, USSR, Tanzania, South Africa, Kenya.

