

THE GENERAL PROCEDURE IN GEMSTONE IDENTIFICATION AND TESTING

INTRODUCTION:

Gemmology is a science

Gemmology is the science of gemstones, most of which are minerals. Therefore it is related to mineralogy, a branch of the geology. Physics and chemistry are involved in identification of crystalline, chemical and physical (including structural and optical) properties of gemstones. Geology helps to understand the origin, occurrence and geographical distribution in prospecting of gem minerals.

Gemmology deals with the study of gemstones and several other materials appearing similar to them. It deals not only with the study of gem materials, but also gem testing and evaluation methods, cutting and polishing, artificial materials, specially of synthetically manufactured gems, precious metals and alloys, grading, marketing, and sales.

Gemstones and related materials

Gemstones are naturally formed solids having some qualities or values which extend beyond the essential and useful needs to the human being. They are used for personal decoration. In addition are the ornamental materials used in decoration of objects rather than for adornment. Gemstones have been in use for various other reasons also, such as to maintain good health, cure from deceases, protect from planetary effects and to bring back luck, fame and prosperity.

Gemstones are naturally formed materials, majority of which are brightly coloured *minerals* found in rocks, formed by inorganic process of nature. Few others are animal or plant materials, collectively called *organic* gems. Most of the minerals are of *crystalline* character, having an internal three dimensional regular atomic growth. They are of single *crystals* or of *aggregates* of small crystalline particles grown together. Few other materials such as opal and natural glass are called *amorphous* materials because of non-crystalline character. Few rocks also are used as gem or ornamental materials. They are formed in combination of small grains of several minerals. Out of over 4000+ minerals classified, around 70 species possess qualification for gemstones, and approximately 20 out of these are commonly used.



Gem Mineral of Corundum



Organic material of Red Coral



Crystal of Blue Sapphire



Agate of polycrystalline character
(Aggregate material)



Synthetic Ruby by Verneuil
Process



Opal Doublet



Goldstone- glass with copper pieces

Study in gemmology requires to learn about all *artificial materials* produced to imitate or substitute natural gemstones. These include

Synthetics: These are man-made crystallized materials with definite chemical and physical properties. They include;

- Synthetic gems- having all properties similar to natural gems, eg. Synthetic ruby
- Man-made crystalline products, having no natural counterparts, eg. Cubic Zirconia

Composite (or assembled) gemstones They are parts of natural or synthetic gem materials or glass and similar materials, cemented together with dyes, coatings or dyed cement

- **Doublets-** two parts of materials cemented together
- **Triplet-** of three parts materials cemented together..
- **Reconstructed stones,** made out of sintered or heated fragments of a gem material, pressed together into a mass.

Pastes: Glasses, ceramics and plastics made with different compounds to produce imitations.

Imitation or simulant is the term given to any natural gem, synthetic or paste, if used to imitate another gem.

Important qualities of a gemstone

A gemstone can be valued for its natural growth having the traditionally quoted “three cardinal virtues” of beauty, durability and rarity. Acceptability and portability are another factors decided by the society for valuation of gemstones.

Beauty is related to the results of the visible light by interaction with the gemstone. These effects are different for different types of gem materials, specially in relation to the degree of transparency.

Durability is related to the structure, which depends on hardness against scratching, toughness against breaking and stability against external forces such as heat, pressure, shock, chemical action etc.

Rarity of a gemstone depends on its availability, and the valuation is decided by the supply and demand theory in economics.

Gemstone Nomenclature

All the gem minerals are grouped into different species according to their chemical composition, and each species is subdivided into varieties in relation to colour or any other special optical characteristics. Some gemstone species are collectively described into families or groups, specially according to their similar crystalline character.

Gems have been named on the basis of color, special optical effects, place of occurrence, believed mysterious properties, a special characteristic, or to honour the discover or person. Trade names are assigned, even if misleading in order to promote sales. Today new gem names must be presented for evaluation by the Commission on New Mineral Names of the International Mineralogical Association. The Confederation Internationale de la Bijouterie, Joaillerie, Orfevrerie des diamants, perles, et pierres or CIBJO (International Association of Jewelry, Silverwares, Diamonds, Pearls, and Stones) is an international body to oversee gem definitions and trade customs.

Requirements in Gem Identification

The process of gemstone identification and testing involves two aspects;

- a. The correct identification of the species and variety to which a gemstone belongs.
- b. To express the measurements or distinctive characteristics by using gemmological instruments.

Testing of gems using common gem testing instruments is done within a limited range. In some instances, further testing may be needed through the following methods;

- a. By applying some changes to the specimen, such as unsetting of a mounted stone, repolishing of facets or making a polished flat surface on the rough stone.
- b. By using advanced techniques. Such methods are used only when the common gem testing methods are not possible.

Although the diagnostic features of a gemstone are observed, the specimen should be named only when the identity can be proved in relation to its identified properties.

It is always convenient to follow an ordered procedure, starting from observations with the unaided eye, and then with the use of instruments,

State of the testing material:

Methods of observation and testing should be decided according to the state of the test specimen- whether it is a crystal, an aggregate, any form of rough material or a fashioned gemstone. If the stone is fashioned, whether faceted, cut on cabochon or in any other form. Also whether the gemstone is mounted in a jewellery or unmounted.

Perfectly flat crystal faces of a crystal or part of a crystal can be used for observations as done for a faceted gemstone. In a rough stone such a flat surface should be made if essential, and on the owners approval. Drill hole in a pearl will be useful to observe the conchiolin layer above the bead of the cultured pearl.

If the gemstone is mounted, the type of setting should be observed in order to decide whether it can be placed on the refractometer table.

Measurement for **size** and **weight** should be taken for faceted gemstones and only the weight for cabochon cut gemstones as well as for the rough. But when necessary, the size may also be taken for the cabochons.

The size is measured in the order of length, breadth and height of the gemstone and is expressed in millimetres (mm.) to the first decimal position, and for more accuracy, to the second decimal position. The length and the breadth should be taken from the girdle and the height from table to the culet.

eg. : 7.0 x 5.0 x 3.5 mm.

Equidimensional shapes of round, square, heart, triangular etc. are written in the same way.

eg. : 5.0 x 5.0 x 3.5 mm..

The weight of a fashioned gemstone is measured in carats and expressed to the second decimal position. Small rough materials are also measured in carats and large quantities in grams or kilograms as required.

Units of measurement:

a. <u>Metric weight unit</u>	<u>Unit Symbol</u>	<u>Equivalent Units</u>	<u>Application</u>
1 Kilogram	kg	= 1000 grams	Weighing large rough materl
1 Gram	g	= 5 carats	Weighing rough gem material
1 Carat	ct	= 1/5 gram	Weighing fashioned gemstones
		= 0.20 grams	
		= 100 'points (weight of small diamonds)	
b. <u>Metric length unit</u>	<u>Unit Symbol</u>	<u>Equivalent Units</u>	<u>Application</u>
1 Centimetre	cm	= 10 millimetres	
1 Millimetre	mm	= 1/1000 metre	Measuring fashioned gemstones
		= 10,00,000 nanometres	
1 Nanometre	nm	1/10,00,000 millimetre	Measurement of wavelength

Description of fashioned gemstones:

Description of the basic cutting shapes and styles for both cabochon and faceted gemstones;

- a. Cabochon cuts gemstones: Description based on two conditions - shape and styles.

Styles: Simple cabochons - with high dome, medium dome or low dome.

Also Double cabochon and hollow cabochon.

Shapes: Oval, round or other shapes. Also cushion shapes such as square cushion, triangular cushion etc.

- b. Other types of curved surfaces such as spheres, beads, tumbled shapes, carvings etc.

- c. Faceted gemstone: Cut and polished with small flat surfaces.

Styles: Brilliant, step, star, cross (scissors), barion etc.

Shapes: Standard or basic shapes such as round, oval, heart, square, rectangle etc.
Variations of standard shapes such as square cushion, cut-corner square etc.
Fancy shapes and free forms such as lozenge, shield, kite etc