Zambia's Zeal for Gemstones: A Review of Historical Development

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Abstract. The occurrences of gemstones was first recorded in Zambia (Luanshya) in 1928 about 85 years ago. Gemstone is naturally formed minerals (rocks) namely, emerald, diamond, pearl, tanzanite, and many more, numbering over 250. These are highly priced due to their beautiful colours and their use in jewellery, home decorations and also in some industries for various purposes. However, its commercial extraction began in 1980 when it was classed as small scale mining due to about 20% of its revenue generation which boosted the country economy. The paper discusses the historical development of Gemstone industry, examines the difficulties and challenges in the growth of this industry and finally gives a brief technical know-how to differentiate between the genuine gemstones and a fake one.

Introduction

What is a gemstone? It is naturally occurring minerals (rock) namely, emerald, aquamarine, citrine (topaz), or from marine animals for examples, pearl, amber, coral and even from some marine plants and trees. In simple terms, it is a stone of varieties of colours and valued by men for their beauty and durability for use in jeweler, ornaments. Gemstones are thus defined as minerals, rocks and organic substances of once living animals (amber, pearls, and corals) which have been naturally formed, without the influence of mankind. Gemstones, as mineral, have a specific characteristic that differentiates them from copper or nickel. It is an attractive and beautiful mineral hard and durable enough to retain its commercial value and reasonably uncommon to make it valuable.

According to Zambia's mining record, prospecting for gemstone first started in 1928 by a Rhodesian Congo Company at a place named Miku, followed by a Brazilian Company (Rio – Tinto) in 1953. Both these companies failed to locate any deposit and the gemstone remained dormant. After a gap of almost fifteen years the Geological Survey of Zambia, between 1967 – 1969, assisted by Nkarulu and Pirala, located several gemstone deposits which became a fortune for the country. Since then, it became the lure of quick richness and triggered people looking for gemstone all over even bare foot which has now considered as a major gemstone producing country. This has apparently changed the old concept of Zambia being a country only for rich copper deposits and game parks.

It is important to note that a crude gemstone (without cutting and polishing) has a little or no value for the use in jewellery and ornaments. The technology of cutting and polishing, known as LAPIDARY is being currently assisted by experts from abroad such as Brazil, Belgium, Italy, India and many others. Now, the Government of Zambia has started training the indigenous people in Lapidary by hiring experts from abroad, since April 2011.

Gemstones Industry in Zambia

A Historical Review

Zambia is well endowed with mineral resources and the economy derives a large part of its foreign exchange earnings from export of its minerals. A wide range of minerals occurs in the country but the mining industry has been dominated by copper and a few other metals namely lead, zinc, silver, gold and cobalt. Although the predominant position of copper mining in the economy has largely overshadowed the exploitation of other potential mineral resources, in recent years,

gemstones, namely emerald and amethyst have begun to assume a significant role. The gemstones of Zambia include emeralds, amethysts, aquamarines, garnets, tourmalines, rose quartz, agate, amazonite, coloured quartz and others. Until the early 70s only malachite and amethyst were being exploited for commercial sale.

The major deposits of gemstone in Zambia are shown below (by courteous of *Babbili Gems,Lusaka)*:

Figure 1 Gemstone Deposit in Zambia

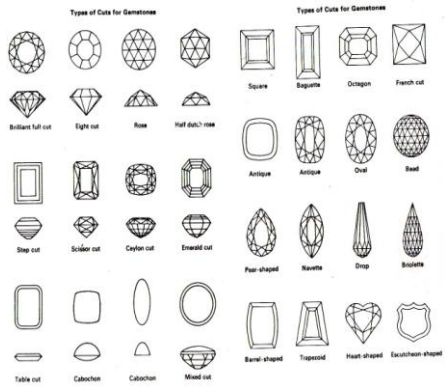

Figure 2 Different varieties of gemstones cuts

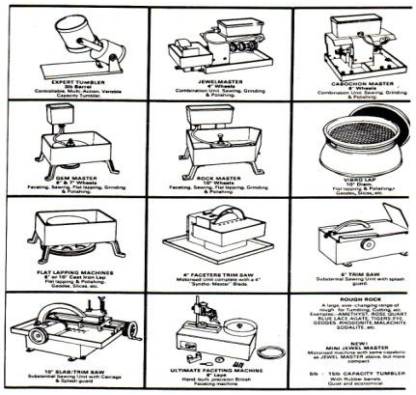

Figure 3 Equipment used in Lapidary Laboratory

Factors Determining the Value of Gemstones

Unlike other minerals, there is no standard or fixed price for gemstones. Prices vary in all major gemstone markets, though the same factors of colour, clarity, weight and the quality of the cut and polishing are used in determining the value.

Gemstone Quality Enhancements

Gemstones are enhanced in order to improve their quality and thus increase their value. There are several methods in which gemstone quality can be improved.

(a) Heat treatment
(b) Irradiation
(c) Glass filling, oiling
(d) Surface diffusion
(e) Foils
(f) Dyeing
(g) Laser Drilling of Diamond

Examples:

(a) Topaz can be heat treated from brown, orange to pink, red, violet. The original colours can be achieved through irradiation.

(b) Zircon

Reddish – brown zircon, can be transformed to the more popular blue color by heating it to around 1000C in a reducing (oxygen – free) atmosphere. The color change is permanent but the color intensity may fade slowly over the period of time if exposed to strong sunlight.

(c) Green, and blue – green beryl (aquamarine) is heated to around 450 C to produce the more popular shades of blue aquamarine.

(d) All zoisite (Tanzanite) is heat treated to produce the intensive blue colour (sapphire blue).

(e) Amethyst is heat treated to produce citrine (yellow) or prasiolite (green). Further heat treatment of amethyst results in colourless or milky quartz, a perfect imitation of the moonstone.

(f) Emeralds are oiled (with baby oils or other oils with same refractive index as that of emerald) in order to make flaws invincible.

(g) Laser drilling is used in diamonds to "burn" out inclusions and then later fill the cavities with glass.

With an exception of heat treatment (where colour change is permanent) all other gemstone enhancement methods must be declared as such. Oiling of emeralds is an exception if the oil used is colorless. These and many other regulations are government by the International Confederation of Jewellery, Silverware, Diamonds, Pearls and Gemstones (CIBJO).

These regulations also give guidance as to the correct names of various gemstones Synthetic.

Gemstones

Synthetic gemstones are artificially made by man from the same ingredients that nature used when forming her stones. The Chemical composition and physical/optical characteristics are almost identical to their counterpart natural stones. There are however, artificially produced gemstones which have no corresponding counterpart in nature. These are known as artificial products. Production of synthetic gemstones started as way back as in the 18th century and has steadily increased. At present almost all gemstones have been produced in the laboratory: ruby, sapphire, emerald, alexandrite, quartz, diamond etc. The reason for the production of artificial gemstones is the ever increasing demand, which is not satisfied by the natural gemstones. However, the presence of synthetic gemstones on the market has brought its own problems:

(a) The traditional market for natural stones is now challenged by the synthetic stones which in most cases look exceptionally better (excellent colour and clarity).

(b) To a common person, it is virtually impossible to distinguish between synthetic and natural stones. The result being cheating by unscrupulous gemstone dealers. Large quantities of synthetic emeralds produced in Russia and USA have ended up being sold as natural emeralds in many parts of the world. The common trick is to mix the (cut and polished) synthetics with the natural stones and sell the whole parcel as natural stones.

(c) The distinction between synthetic and natural gemstones possesses a big challenge to a gemologist. It requires a lot of experience and the necessary gemological instruments to separate the two. It is highly recommended to make use of the gemological expertise at SADC – MCU and GSD to verity whether synthetic or natural, because the scale of cheating is real and increasing.

In contrast to synthetic gemstones which have the same chemical composition, crystal system and physical constants as their natural counterparts, a stimulant has only the external appearance of the gemstone it imitates. The materials used to simulate the more costly gemstones range from other natural gemstones to various man–made gemstones and glass.

Characteristics of Gemstones

How to differentiate between genuine and fake gemstone?

The distinct properties of gemstone play an important role in determining the genuity and quality and hence the value. Few of them are Durability, Hardness. Toughness, Stability, color and rareness and is probably the most important physical attribute in evaluating a gemstone, and has three aspects: *hardness*, *toughness* and *stability*.

Concluding Remarks

- The occurrences of gemstones was first recorded in Zambia (Luanshya) in 1928 about 86 years ago.
- Gems are stones valued by man for their beauty, rarity and durability. They are used in jewellery (based on their durability) and for ornament. Except for a few, such as amber, coral, pearl and jet which are organic in origin, most gemstones are naturally occurring minerals. Whereas there is no intrinsic value or use, gems are prized because of their rarity, and fashion often determines the popularity of gems.

Gems are formed in several ways mainly in igneous rocks such as, Pegmatite, in the scars formed by contact metamorphism. Some gemstones including diamond are found as crystals or rolled pebbles in alluvial gravels of river beds; i.e. sediment hosted.

Gemstones are identified by the form or shape of the uncut crystals, their colour, hardness, refractive index and specific gravity or density. A gemstones value is established by rarity, brilliance, purity, colour and hardness. Gems of high refractive index show great brilliancy, also dependent on transparency and polish and prismatic dispersion (fire). Other attractive optical effects include chatoyancy or cat's eye, dichroism or double refraction, opalescence and asterism – a star shaped gleam caused by irregular inclusions in the crystal lattice.

The main gemstones of Zambia are emerald, aquamarine, amethyst, tourmaline, rose quartz, garnet amazonite, smoky quartz, crystal quartz, feldspar, malachite, azurite, jasper, cherty, chalcedony, hematite, sodalities etc. Zambia's gemstone resource is substantial and exploitation is carried out on small and large scale. At present there is a well established lapidary for emeralds and other smaller lapidaries for less valuable stones. The industry is in its infancy and the future is full of promise. The legislative framework of Zambia is being revised to cater for this growing sector of the mining Industry.

Equipment Suppliers

1. Protective/safety Apparels (eye, ears, lungs etc.) Iteco Incorporated, P.O Box 29531, Columbus Ohio 43229, USA.
2. Lapidary Items, Ebersole, 11417 West Hiway 54, Dept. RM, Wichita, Kansas 67209 – 1234, USA.
3. Elliottes sher, Thai Faceting Company, P.O. Box 6041, Department R. Bellevue, Washington 98008 – 0041, USA.
4. Lentz Lapidary Inc., 11740 S. Oliver, Rte 2, Box 135, Mulvane Kansas 67110, USA.
5. Beach Lapidary Machines, M.L. Beach products Limited, 41 Church Street, Twicheham middlesea England.

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[9] Rocks and Minerals, Bimonthly magagine on minerals, Written in easy to understand language, 4000 Abbermarle Street, NW. Washington DC. 20077-5010, USA.

[10] Retail Jeweller, Knights way House, 20 Seho Square, London WIV 6DT UK.