

THE GEMMOLOGISTS ASSOCIATION OF SRI LANKA

in collaboration with the

NATIONAL GEM AND JEWELLERY AUTHORITY

Present

GEMMOLOGISTS ASSOCIATION RESEARCH SYMPOSIUM 2023

GARS 2023



**PROCEEDINGS OF GEMMOLOGISTS ASSOCIATION
RESEARCH SYMPOSIUM 2023
GARS 2023**

"Application of Gemmology to Enhance the National Economy"



02nd December 2023

Organisation of Professional Associations of Sri Lanka, 275/75,
Prof. Stanley Wijesundara Mawatha, Colombo 07

EXTENDED ABSTRACTS

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**Proceedings of Gemmologists Association Research
Symposium 2023
GARS 2023**

"Application of Gemmology to Enhance the National Economy"

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Gemmologists Association Research Symposium 2023

GARS 2023

Gemmologists Association of Sri Lanka

Date : 02.12.2023

Venue : Organisation of Professional Associations of Sri Lanka, 275/75, Prof. Stanley Wijesundara Mawatha, Colombo 07

PROGRAMME

01.30 pm - 02.00 pm	Registration of Participants
02.00 pm - 02.05 pm	National Anthem
02.05 pm - 02.10 pm	Welcome address by Mr. G. W. Udaya Kumara (President - GASL)
02.10 pm - 02.15 pm	Address by Mr. N.I. Balage (Chair - GARS 2023)
02.15 pm - 02.20 pm	Address by the Chief Guest, Mr. Viraj De Silva (Chairman - NGJA)
02.20 pm - 02.30 pm	Keynote address by Mr. Pinsiri Wijayapala (Vice President - SLGJA)
02.30 pm - 03.30 pm	Technical Session (Chairperson - Prof. P.G.R. Dharmarathne, Panelist - Dr. Gamini Zoysa)
03.30 pm - 03.45 pm	Refreshments
03.45 pm - 05.05 pm	Technical Session (Chairperson - Prof. P.G.R. Dharmarathne, Panelist - Dr. Gamini Zoysa)
05.05 pm - 05.10 pm	Recognitions of Reviewers/ Presenters and Certificate Awarding
05.10 pm - 05.15 pm	Vote of Thanks by Mr. K.A.G. Sameera (Secretary - GARS 2023)

Gemmologists Association Research Symposium 2023

GARS 2023

02nd December 2023

Technical Session

Chairperson : Prof. P.G.R. Dharmarathne

Panelist : Dr. Gamini Zoysa

Moderator : Mr. Samitha Liyanage

02.30 - 02.50 UNVEILING THE MILLENNIA-LONG JOURNEY OF SRI LANKA'S VIBRANT JEWELLERY HERITAGE AND ITS POTENTIAL FOR MODERN DEVELOPMENT

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02.50 - 03.10 REVITALISING SILKY GEUDA (CORUNDUM): TRANSFORMING THE LOST ELEGANCE OF SILKY GEUDA INTO ENCHANTING BLUE SAPPHIRES WITH AN INNOVATIVE INTEGRATED HEAT TREATMENT APPROACH

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03.10 - 03.30 IMPACTS OF RIVER BED MINING ON WATER QUALITY IN HANGAMU GANGA, SRI LANKA

N.K. Surige, S. Illangasinghe, S. Diyabalanage, N. Jayasinghe, B.C.L. Athapattu

03.45 - 04.05 GENESIS AND OCCURRENCE OF GEM MINERALS IN THE ELAHERA GEM FIELD, SRI LANKA: INSIGHTS FROM SEDIMENTARY, RESIDUAL, AND ALLUVIAL DEPOSITS IN THE KALU GANGA RIVER CATCHMENT

N.I. Balage, U.B. Amarasinghe, R.L.D.S. Ranasinghe

04.05 - 04.25 FROM TRADITION TO INNOVATION: UNVEILING THE DYNAMICS OF ART JEWELLERY IN MODERN PRACTICES

L.L.Y.R. Lenaduwa, B.A.N. Eranda

04.25 - 04.45 DETERMINING THE PROVENANCE OF GEM VARIETIES DERIVED FROM DIFFERENT LITHOLOGICAL UNITS: A CASE STUDY IN THE HALANGODA LAKE AT DIYATHALAWA

K.M.D.C.M. Wimalasuriya, G.A.U.P. Abeypala, J. T. Cooray

04.45 - 05.05 ENHANCING COLOR IN *YOUNG GEUDA* SAPPHIRES THROUGH INNOVATIVE HEAT TREATMENT TECHNIQUES

M. Nirushan, S. Illangasinghe, C. Jaliya

UNVEILING THE MILLENNIA-LONG JOURNEY OF SRI LANKA'S VIBRANT JEWELLERY HERITAGE AND ITS POTENTIAL FOR MODERN DEVELOPMENT

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Sri Lanka consist of very rich and old jewelry heritage which has been evolved throughout several millenniums. The main objective of this study is to find out the origin, evolvement, present status and exposing this heritage as how can it be used for the future development of the present jewelry industry.

Data were collected using various methods at specifically selected sites as well as randomly selected sites across Sri Lanka included; literature survey; study the archaeological museum specimens at Anuradhapura, Polonnaruwa, Sigiriya, Tissamaharama, Colombo, Kotte, Kandy and private collections; examination of ancient sculptures, surviving artefacts of stone, pottery, metal, wooden and ivory carvings temple paintings, frescos, murals scattered in those ancient cities; study the real specimens of gold, silver, bronze, copper jewelry belonging to different eras. The art collection of one of the authors, which was done based on the research conducted by himself also was referred. All the specimens were photographed, documented, base sketches were done, selected few specimens, casting was done and produced few of those as samples.

The multidisciplinary evidence of researches, from Beli-lena, Fa Hien-lena, and Batadomba-lena as one of the oldest Homo sapiens rainforest sites outside of Africa, from 48,000 ago through to 3000 years ago in the Wet Zone of Sri Lanka, proved that; land snail shells, marine shells, shark teeth, ochre beads etc. have been used as jewelry with colorants of Silver (mica), dark-to-bright reds, and then bright yellow and show signs of rounding, polishing and perforated with holes for stringing. A researcher has reported the use of shells and operculum as jewelry by "Balangoda man" around 39000-28000 years before present.

The next era begins 3000 years before present. The carnelian bead necklaces (700-600 BCE) found in Ibbankatuva Megalithic Tombs are examples that can be

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given. According to Mahawamsa Lord Buddha's second visit (625-545 BCE) was to settle the dispute between two kings on a Gem-Studded Throne. Large number of rings, earrings of gold, lead, bronze, copper and beads made out of sapphire, jet, amber, aquamarine, beryl, amethyst, garnet, spinel, carnelian, agate, rock crystal, clay, glass, in different sizes, shapes and colours were discovered and recorded by a researcher in Akurugoda and surrounded area belongs to 900 BCE to 1400 CE, where the city center of former Magama kingdom with evidence of carvings, drilling the corundums and faceting also recorded confirms the existence of a bead making industry. Evidence of Mathota, clearly confirms the Indian ocean trade around 600-500 BCE in exports of carved ornaments and jewelry of various materials such as gold, silver, horse bone and teeth, Tortoise shell, shell, ivory, pearls, sapphires and rubies while imported lapis lazuli from Afghanistan, carnelian from Gujarat, basalt from Deccan Plateau, Amaravati marble from South India. Excavations of a research team in port city of Mathota mentioned as 450 BCE-1200 CE found crucibles indicated the manufacturing jewelry by melting and mixing of metals of "white metal", silica crystals, copper minerals, green carbonates, red oxides, zinc, low tin bronze, manganese with CaO used as flux.

Among the Jethavana treasures dated between 200 BCE to 300 CE, there are more than 600,000 beads fabricated from different materials such as clay, glass, crystal, stone, precious and semi-precious stones, agate, carnelian, ivory, bone, shell, gold, silver, bronze ware and etched beads; in the manufacturing process were carried out at the Abhayagiri complex (89-77 BCE), it has been recorded that, to obtain the colours of the artifacts, metal compounds such as copper, vanadium, magnesium, nickel, chromium, tin and lead were used and that melting, mixing and metal plating of iron, copper, gold and silver metals with selected crucibles and furnaces. Dolomite, marble, granite & gneiss were used to design ornaments in 600-500 CE in Sri Lanka and also Indian origin ornaments were there which were designed by fine grain granite gneiss in 400-200 CE. Some of the master pieces found in the research with rich jewelry belongs to 1100-1400 CE were statues of God "Vishnu" made by gneiss, coral and bronze; two statues of God "Vishnu" made by gneiss, Goddess Parawthi, a statue of Nataraja from bronze.

Frescoes, sculpture and temple art in Sigiriya and vessagiriya (450 CE); Myella, Thiwanka pilimage (1153-1186 CE), Wooden carvings in Ambakke Devalaya (1371 CE); Kandyan temple art and Ivory carvings in Rideevihara (161-137 BCE) and Dambulla were unique resources.

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Drilling, polishing, colouring and stringing for jewelry far back as 48,000 yrs. before present is a unique feature. There is a very rich jewelry heritage existing in Sri Lanka which has been developed over 3000 years, those jewelry have been influenced by foreign cultures in time being and now can be turned into a modern trend for the development of local /export Sri Lankan jewelry market.

Keywords: Archaeological specimens, Development in Jewellery industry, Evolution of jewellery, Sri Lankan jewellery heritage

REVITALISING SILKY GEUDA (CORUNDUM): TRANSFORMING THE LOST ELEGANCE OF SILKY GEUDA INTO ENCHANTING BLUE SAPPHIRES WITH AN INNOVATIVE INTEGRATED HEAT TREATMENT APPROACH

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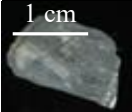
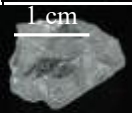
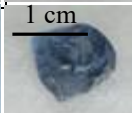
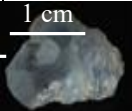
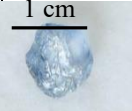
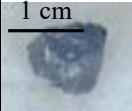
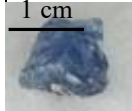
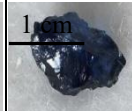
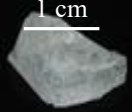
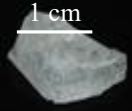
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Geuda refers to corundum (Al_2O_3) of low gem quality, exhibiting colours like blue, yellow, or red after undergoing heat treatment. It comprises semi-transparent to semi-translucent corundum with whitish, bluish, or semi-brownish tones, often displaying a distinctive "diesel effect" (colour of diesel fuel in transmitted light). Originally, traditional charcoal heat treatment was used to improve colour, but now heat treaters commonly employ gas-fired heat treatment. A recent trend involves a combination of gas and electric heat treatment to further enhance colour. This research aimed to assess the colour enhancement of Silky Geuda using both gas and electric furnaces. Silky Geuda, distinguished by a shining effect known as "silkeness," on the surface under reflected light which can be heated to higher temperatures while preserving its commercially valuable blue colour compared to other geuda varieties. Thirty samples of similar quality and appearance were chosen for the study. Six samples were kept as untreated reference samples, and the remaining samples were exposed to gas heat treatment using a Lakmini furnace that provides a soaking temperature of 1850°C for $1\frac{1}{2}$ hour soaking period under reducing ambient air condition. Among gas-heat-treated samples which underwent direct flame heat treatment, six samples were kept as gas-heat treated reference samples. The remaining samples were divided into three equal groups and subjected to electric heat treatment at three soaking temperatures of 1550°C , 1650°C and 1750°C under ordinary atmospheric conditions for an exact period of 720 hours (about one month). The colour intensities assessed through several methods including naked eye visual inspection and under the 10x magnification, and examination of photo images were compared and graded based on the

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Gemological Institute of America (GIA) Gemset colour grading system. Photo images of reference samples and other heat-treated samples are shown in Table 1. Visual inspection, magnification using a 10x lens, and the photo images reveal that the intensity of the blue colour of heat treated specimens have enhanced to light violetish blue (vB3/3) under gas heat treatment. Furthermore, this light violetish blue was enhanced to medium light violetish blue (vB4/3), medium dark violetish blue(vB5/3) and dark violetish blue(vB6/3) under electric heat treatments of 1550°C, 1650°C and 1750°C, respectively.

Table 1. Untreated, gas heat treated and combined heat treated Silky Geuda samples

Unheated	Gas heated	Gas and electric heated for 1550°C	Gas and electric heated for 1650°C	Gas and electric heated for 1750°C
				
				
				
				
				
				

In conclusion, this integrated heat treatment procedure, comprising sequential electric heat treatment succeeded by gas heat treatment, can substantively augment the colour and clarity of Silky Geuda to a greater extent than singular conventional gas heat treatment methodologies. Intensity of blue colour increases with the increase of the temperature of electric heat component up to 1750°C of the combined heat treatment. Because of high concentration of inclusions inside geuda, this two-step heat treatment process can be used to obtain the optimum colour of Silky Geuda.

Key words: Blue colour, Electric heat treatment, Gas heat treatment, Silky Geuda, Temperature

IMPACTS OF RIVER BED MINING ON WATER QUALITY IN HANGAMU GANGA, SRI LANKA

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Sri Lanka, renowned for its precious gemstones, employs various mining techniques to unearth these world-famous gems. However, these mining activities have triggered severe environmental consequences, particularly riverbed mining, which has adversely affected the water quality of Sri Lanka's river systems. However, scientific investigation into water quality damage by mining is yet to be properly investigated. Thus, this study aimed to comprehensively evaluate the impacts of riverbed mining on water quality in the Hangamu Ganga.

To measure the suspended sediment concentration (SSC) induced by riverbed mining, depth-integrated water samples were collected from points located at various distances along the river, including 10 meters upstream of the mining site and 5, 25, and 100 meters downstream, at four-hour intervals throughout a one day. Additional water samples were collected for testing water quality parameters and heavy metal analysis.

The SSC was determined by weighing the sediment after the removal of water through heating, using an analytical balance. Heavy metals, including Cr, Cu, Cd, Mn, Pb, and Fe, were quantified using the Inductively Coupled Plasma Mass Spectrometry (ICP-MS) method. Water quality parameters such as Dissolved Oxygen, pH, temperature, Total Dissolved Solids (TDS), conductivity, ammonia, total phosphate, Chemical Oxygen Demand (COD), turbidity, Total Suspended Solids (TSS), Nitrate, and Nitrite were analyzed using standard methods.

The resulting SSC in 10 m upstream to the mining, 5, 25, and 100 m downstream to the mining ranged from 12-35, 16-92, 14-83, and 12-62 mg/L, respectively. The mining-induced SSC increased from 6 to 8 times downstream to the mining site between 9 a.m. to 4 p.m. This time period corresponds to mining activity. Mining-induced heavy metal concentrations of Fe, Pb, Mn, Cd, Cu, and Cr varied from 1.4-2, 0.005-0.01, 0.24-0.28, 0.002-0.006, 0.007-0.05, and 0.04-0.05 mg/L, respectively. The analyzed water quality parameters of pH, Dissolved Oxygen, turbidity, conductivity, TDS, Nitrate, and Phosphate concentration in water samples varied from 6.2-6.3, 5.2-5.3 mg/L, 33-41 NTU, 47-51 mg/L, 0.6-1.5 mg/L, and 0.6-1.4 mg/L, respectively during mining period. Subsequently, the considered temporal variation of the results of this study clearly revealed that riverbed mining induced the SSC, and heavy metals and changed the water quality parameters. Moreover, the findings of this research clearly revealed that mining-induced SSC gradually decreased with distance may be due to the re-settlement of heavy particles. Therefore, it can be concluded that the river bed mining adversely affected on river water quality in Sri Lanka.

Keywords: Mining-induced sediment, Heavy metal, Hangamu Ganga, Suspended sediment, Gem mining

GENESIS AND OCCURRENCE OF GEM MINERALS IN THE ELAHERA GEM FIELD, SRI LANKA: INSIGHTS FROM SEDIMENTARY, RESIDUAL, AND ALLUVIAL DEPOSITS IN THE KALU GANGA RIVER CATCHMENT

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Gem deposits are frequently found in specific terrains characterised by high-grade metamorphic rocks. This research focuses on the Elahera gem field, situated in the north-central and central provinces of Sri Lanka, renowned for its abundant gemstone production. The study primarily aims to discern various types of gem minerals in stream sediments, residual soils, and historical alluvial deposits in this region. Also, the transportation of gem particles and diverse deposition processes in varied environments contribute to the genesis and occurrence of gem minerals.

The research uses aerial photographs and geological maps to identify geological features influencing sediment deposition and transportation. Gem minerals are extracted from stream sediments, separated from mineral concentrates through heavy liquid (sodium poly-tungstate) and mechanical sieve separation (63-1000 µm range), and subjected to magnetic separation for further refinement. Laboratory grain mounts are prepared to identify and quantify gem mineral grains.

Field observations and aerial photographs indicate that the Kalu Ganga river catchment area features a network of first and second-order streams for gem mineral transportation. The Kakkutu Ulpatha tributary originates from a joint fracture in gneiss bedrock, connecting to the Hunukotuwa canal. The Hunukotuwa and Etamagolla canals are crucial in transporting and depositing sediments from the weathering of gem mineral-bearing source rocks. The study posits that gems may originate in the bedrock and be transported by stream flow.

The Kalu Ganga River, flowing through a strike valley, exhibits weathering and erosion of bedrock foliation layers from different source rocks. Primary gem minerals are associated with the gem mining area within paddy fields. Sediment

visual analysis indicates well-sorted gem mineral grains in sedimentary deposits formed under flowing water, while primary deposits form in situ in residual soils due to bedrock weathering. Alluvial beds near rivers contain transported gem minerals in rounded and sub-rounded pebbles, sand, and clay.

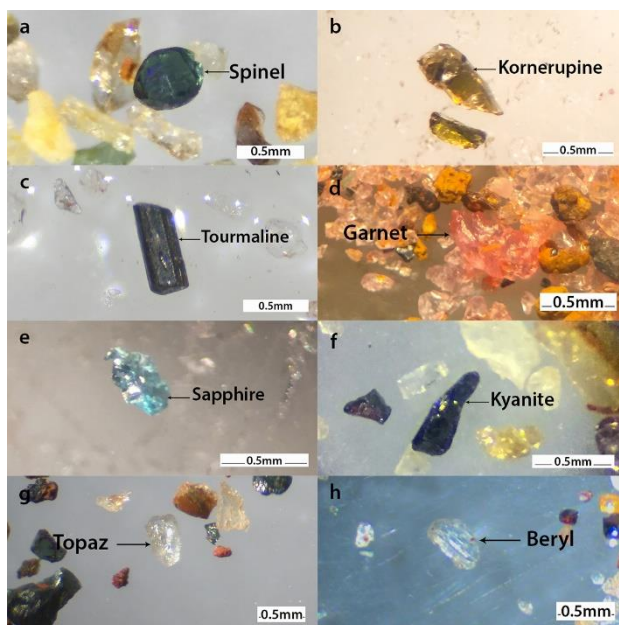


Fig.1. Identified gem minerals from the studied samples, (a) spinel (b) kornerupine (c) tourmaline (d) garnet (e) sapphire (f) kyanite (g) topaz (h) beryl

Optical mineralogical studies reveal various gem minerals, including garnet, spinel, quartz, tourmaline, kornerupine, zircon, calcite, topaz, feldspar, beryl, corundum, chrysoberyl, and kyanite (Fig. 1). Different colours of spinel and garnet are significant; bluish ash colour was predominant, and a series of blue and pink spinels were observed. Orange to dark red coloured hessonite, pyrope, almandine, and rhodolite garnets were observed and the higher hardness of the garnet protects the grain size, angular garnet grains with conchoidal fractures suggest resistance to mechanical weathering, indicating primary gem deposits. Tourmaline and zircon presence suggest granitic pegmatites as source rocks. The

study also notes the presence of colourless blue, and yellow sapphires, hinting at the residual deposits in the marble-rich area. A study of characteristics of sillimanite in the study area suggested that they are largely derived from the khondalites.

The area's gem deposits primarily derive from marble, skarn, charnockites, and garnet-sillimanite biotite gneisses. Geological maps and field data provide insights into gem-bearing source rocks in the upper catchment of the drainage basin, with pegmatite and hydrothermal intrusive rocks identified as potential gem-bearing rocks. The study recommends further exploration of gemstone source rocks in the upper catchment.

Keywords: Elahera gem field, Aerial photographs, Magnetic separation, Gem minerals

FROM TRADITION TO INNOVATION: UNVEILING THE DYNAMICS OF ART JEWELLERY IN MODERN PRACTICES

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The essence of art creation, a profoundly human pursuit, has transcended through time, resonating in the enduring craft of jewellery making. This age-old impulse continues to captivate individuals drawn to the profound connection with materials, the inherent challenges of construction, and the satisfaction derived from problem-solving in the pursuit of completing a unique project. Whether fuelled by a passion for personal designs or a desire to articulate ideas in this intricate medium, artisans are enamoured by jewellery's personal and treasured nature, creating a symbiotic relationship between creator and wearer. This abstract employs a literature review methodology to address the central inquiry: "What are the dimensions of art/studio jewellery, and how does it interact with the human body?" The review aims to comprehensively explore and discuss diverse facets of art/studio jewellery in relation to the human form. Since its inception in the 1960s, studio jewellery has evolved into a widely embraced art form, extending its reach and transforming into an accessible realm abundant in innovative ideas. Distinct from commercial ventures, it engages with design, architecture, fine arts, and various applied art disciplines, prioritising self-expression. The nomenclature for studio jewellery includes terms such as contemporary, studio, art, research, design, and authorship. Art jewellery, a subset crafted by studio artists, emphasises creative expression and design, often utilising unconventional materials with low economic value in traditional media. This genre shares commonalities with broader studio craft in beliefs, education, production circumstances, and distribution networks. Additionally, art jewellery demonstrates connections with fine art and design. The studio jeweller assumes the dual role of designer and fabricator, operating within a small, private studio setting. The emphasis on handmade craftsmanship and a dedication to innovative thinking define art jewellery. Despite rejecting

mainstream jewellery tastes, these artists value creativity, using materials like base metals, acrylics, semi-precious stones, and vitreous enamel to produce affordable and unique pieces. Notably, art jewellers explore the relationship between jewellery and the body, challenging conventional concepts of "preciousness" and "wearability." The monetary value of materials becomes irrelevant, and the symbolic significance of jewellery as a status symbol is dismantled, giving precedence to the symbiotic connection between ornament and the human form. This transformation renders jewellery inclusive across genders and ages.

Advancements in computer-aided manufacturing technologies contribute to the evolution of art jewellery, introducing new materials and production methods. A dynamic dialogue emerges between innovative technology, traditional hand skills, and an organic approach to ornamentation. Artistic themes encompass cultural identity, psychology, memory, existential contemplation, and perceptions of value. Notably, the twenty-first century witnesses a resurgence of creativity across various art and design disciplines, with a notable return of decoration to the forefront. As we navigate this century, marked by technological leaps and societal shifts, the trajectory of art and design developments remains to be determined, leaving room for the continual evolution of jewellery as a form of expressive art.

Keywords: Art jewellery, Studio craft, Creative expression, Body-conscious design, Innovative technology

DETERMINING THE PROVENANCE OF GEM VARIETIES DERIVED FROM DIFFERENT LITHOLOGICAL UNITS: A CASE STUDY IN THE HALANGODA LAKE AT DIYATHALAWA

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National Gem and Jewellery Authority of Sri Lanka launched a gem extraction project at the Halangoda lake which is situated at Diyatalawa in the Badulla District, Uva Province, Sri Lanka in 2009 to extract precious gem stones including yellow sapphire, blue sapphire, star sapphire, chrysoberyl cat's eye, alexandrite, pink sapphire, geuda and semi-precious gemstones including tourmaline, blue spinel, pink spinel, zircon and garnet.

Even though, the gem varieties were identified, it was important to determine the provenance of gem varieties derived from different lithological units in Halangoda lake, thereby to support to predict the gem deposits in the neighboring areas and also allow the gem miners to decide the mining will be economically viable upon giving a more accurate prediction of abundance of valuable gem varieties prior to mining.

This study was carried out to prepare a geological map around Halangoda lake which covers 3.6 km² surface area and to find potential lithological units causative to form different gemstones. Percentages of extracted precious and semi-precious gemstones were calculated by considering its weight separately. Physical properties and percentages of the extracted gemstones were analyzed and correlated with lithological units found by the prepared geological map of the study area. The scale of 1:100000 geology map of Sri Lanka published by Geological Survey and Mines Bureau was used to confirm the abundances of gem varieties derived from each lithological unit.

According to the prepared geological map (scale 1:20000) of the project area, three main lithological units were identified; namely garnet-biotite-sillimanite

gneiss, garnet-hornblende-biotite gneiss and quartzofeldspathic gneiss. Occurrence of other accessory minerals were variable according to the rock types. Some of quartzite traces, pegmatite intrusions and charnockitic gneiss which are not in mappable scale were found. According to the observations of the gemstones extracted from gem bearing gravel in Halangoda Lake are not well rounded. Some of those have well defined crystal shapes and some gemstones are sub angular. When considering the geological and geomorphological features present in the lake area, it has proven that, there is a high possibility to transfer the weathered debris of these lithological units into the lake through the streams. Therefore, these deposits could be exactly residual deposits or eluvial deposits or both. Percentages of extracted precious gemstones were 60% of yellow sapphire, 30% of geuda and 10% of other varieties (blue sapphire, pink sapphire, star sapphire, alexandrite and chrysoberyl cat's eye). All those sapphires and geuda could be derived mainly from garnet-biotite-sillimanite gneiss, and there could be a lesser contribution from charnockitic gneiss. Percentages of extracted semi-precious gemstones were 40% of spinel, 40% of zircon and 20% of other varieties (garnet, tourmaline and quartz). Considering the field mapping data and geology map published by Geological Survey and Mines Bureau, spinel, garnet, tourmaline, quartz and chrysoberyl cat's eye could be derived mainly from garnet-hornblende-biotite gneiss and quartzofeldspathic gneiss, and there could be a lesser contribution from garnet-biotite-sillimanite gneiss. Zircon could be derived mainly from pegmatite intrusions, and there could be a lesser contribution from the three main lithological units.

In conclusion, the most abundant gem varieties; sapphires and geuda were derived from garnet-biotite-sillimanite gneiss, while zircon was derived from pegmatite intrusions. The less abundant gem varieties derived from the three main lithological units were alexandrite and chrysoberyl cat's eye.

Keywords: Garnet-biotite-sillimanite gneiss, Garnet-hornblende-biotite gneiss, gemstones, Halangoda Lake, Quartzofeldspathic gneiss

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ENHANCING COLOR IN YOUNG *GEUDA* SAPPHIRES THROUGH INNOVATIVE HEAT TREATMENT TECHNIQUES

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Through the heat treatment of *geuda* sapphire, both its colour and clarity can be enhanced. While the clarity of *Young Geuda* has traditionally properly improved from heat treatment, achieving significant colour improvement has remained a formidable challenge. Conventionally, gases like nitrogen, hydrogen, and argon have been introduced into traditional furnaces to augment colour development. Therefore, this research will introduce a novel technique employing a tube furnace with changing atmospheric conditions. The resulting colour transformation was also authenticated using the Gemological Institute of America (GIA) colour grading method and UV-visible absorption spectra analysis. The research involved three *Young Geuda* samples and one *Milky Geuda* (serving as a control) acquired from the Ratnapura gem market in Sri Lanka. All samples were sliced and polished into four segments, each subjected to heat treatment at 1700°C for 12 hours under distinct conditions: normal atmospheric, oxygen-enriched, nitrogen-enriched, and continuous nitrogen flow using the tube furnace. Following the evacuation of the air inside the furnace tube until a vacuum pressure of zero was attained, nitrogen gas (N₂) was subsequently introduced into the furnace tube. The furnace cross-section is shown in Fig. 1. Evaluation of the treated samples encompassed visual colour assessment through microscopic imaging, GIA colour grading, and UV-visible absorption spectroscopy.

The results reveal that the blue colouration in *Young Geuda* sapphires is most pronounced when the heat treatment occurs under nitrogen-filled and continuous nitrogen-flowing conditions. The GIA colour grading values further substantiate this remarkable colour shift. Under these nitrogen-rich conditions, I intensified the 575 nm absorption peak attributed to the Ti⁴⁺/Fe²⁺ Intervalence

Charge Transfer (IVCT). The environment created during high-temperature treatment transforms nitrogen gas into nitrogen atoms, with additional pressure within the tube furnace enhancing this process. Consequently, the $\text{Ti}^{4+}/\text{Fe}^{2+}$ IVCT mechanism is facilitated, contributing to the striking blue hue observed in flowing nitrogen.

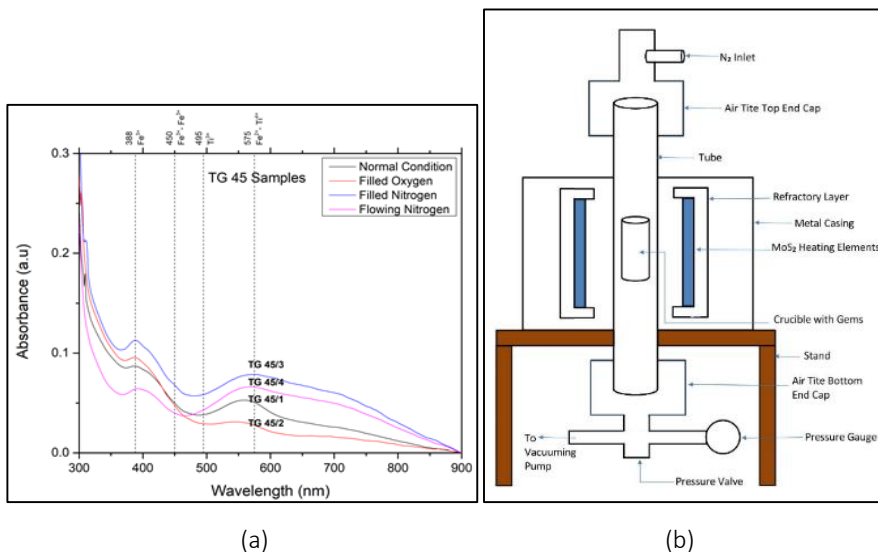


Fig. 1. (a) The UV-visible absorption spectrum of different treated slices of the one sample, (b) The cross-section of the vertical type tube furnace used for this study.

In summary, the investigation underscores the effectiveness of nitrogen-enriched atmospheres in enhancing the blue colouration of Young Geuda sapphires when subjected to heat treatment. This enhancement is verified by the GIA colour grading assessments and the increased peak intensity at 575 nm, which corresponds to the $\text{Ti}^{4+}/\text{Fe}^{2+}$ IVCT process (Fig.1). The findings offer valuable insights into the development of sapphires with a blue hue, shedding light on innovative techniques for gemstone treatment and colour enhancement in the gem industry.

Key Words: Geuda heat treatment, Nitrogen, Young Geuda, Geuda treatment

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"JEWELS 2023" GEM AND JEWELLERY TRADE EXHIBITION AND AWARDS

GASL is a founder member of the Organization of Professional Association (OPA) of Sri Lanka, GASL has successfully conducted the Jewels Exhibition and Competitions giving immense benefits to the Gem and Jewelry Trade in Sri Lanka over a period of a decade. GASL introduces a suitable theme for the prestigious event of Jewels. The theme identified for Jewels 2023 is "Traditional Jewellery of Sri Lanka". This is a three-day event scheduled to be held at the Hotel Taj Samudra, Colombo 15th, 16th, and 17th of December 2023. National Gem and Jewellery Authority (NGJA) has been the main collaborator of the Jewels since 2012.

Objective:

The main objectives of "Jewels 2023" are to promote the Sri Lankan Gem and Jewellery trade and to expand the local trade into the international market, thereby increasing foreign income for the country. In line with this year's theme - Traditional Jewellery, special attention will be dedicated to showcasing Sri Lankan traditional jewellery and their re-creations, which will be launched during the exhibition

Target Participants:

Jewels 2023 eagerly anticipates the presence of a diverse array of participants, both local and international, whose collective contributions enrich the events' objectives.

Concurrent Events:

Existing key events will be taking place concurrently with the Jewels 2023 to recognize the effort of students, researchers and other interested personnel in the Gems and Jewellery sector. Some of the events to be held are,

(i) Gemmologists Association Research Symposium 2023 (GARS 2023) - 02nd December 2023 at OPA premises

The Gemmologists Association Research Symposium (GARS 2023) with the collaboration of NGJA, presents a platform for academics, postgraduate students and researchers from government and private institutes to showcase their research findings across diverse multidisciplinary fields.

(ii) Jewels Talk - 15th December 2023 at Taj Samura Hotel

Jewels talk, an exclusive lecture series featuring distinguished local and International Gemmologists to enlighten the participants on the industry's latest advancements and have a live discussion regarding the trends.

(iii) A display of Traditional Jewellery to Modern Jewellery from 15th to 17th December 2023 at Taj Samudra Hotel

The Jewels team has visited archaeological sites in Anuradhapura, Polonnaruwa, Sigiriya and the National Museum Colombo to gather sufficient evidence on traditional jewellery. Unique paintings of the jewellery will be displayed and after scrutinizing them, the suitable specimens will be cast and recreated in gold, gold plated, silver and copper accordingly.

(iv) Jewels Fashion Show - 15th December 2023 at Taj Samudra Hotel

The fashion show is specifically designed to showcase a fantastic modern jewellery collection as well as traditionally recreated jewellery that will be launched at the Jewels 2023 exhibition. This fashion show will be arranged without using elevated platforms, with models walking through the serene gathering, elegantly showcasing jewellery items.

(v) Jewels Awards for Gem and Jewellery Competition - 17th December 2023 at Taj Samudra Hotel

GASL presents a captivating competition that brings together traders and enthusiasts in the realm of gems and the science of gemmology. The Jewels competition is an integral event parallel to the illustrious Jewels exhibition, which has graced our calendars for over a decade.

The competition is structured across various categories, each poised to highlight and celebrate distinctive facets of gem and jewellery expertise. As we look forward to the competition, the following are the categories that will be passionately contested.

- Fine crystal of high gemmological interest
- Best fashioned gem (faceted, cabochon, carved)
- Lapidary art (faceted or carved)
- Gem studded professional Jewellery
- Photographs related to gemmology or gem industry
- Best recreation of a traditional Jewellery