

Mechanical Engineering in Ancient Egypt, Part 58: Semiprecious Stones Applications

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ABSTRACT

The evolution of mechanical engineering in ancient Egypt is investigated in this research paper through studying the production of some semiprecious-stones. Examples from historical eras between Naqada I and the Late Period are presented, analysed and aspects of quality and innovation are outlined in each one. The use of different semiprecious stones for specific application is focused illustrations the outstanding mechanical engineering tradition. The application of remarkable mechanical technology is focused in the production of wonderful semiprecious artefacts.

Keywords: Mechanical engineering, ancient Egypt, bread semiprecious stones, applications.

INTRODUCTION

This is the 58th paper in a scientific research aiming at presenting a deep insight into the history of mechanical engineering during the ancient Egyptian civilization. The paper handles the production of semiprecious stone products during the Predynastic and Dynastic Periods of the ancient Egypt history.

Bradley (1999) in his book about ancient Egypt outlined that the ancient Egyptians exploited the Eastern Desert for semiprecious stones and mined the Sinai Peninsula for copper and turquoise [1]. Mittler (2005) in his book about art presented colored illustrations for the throne of Tutankhamun inlaid with a number of materials including semiprecious stones [2]. Wilkinson (2010) in his book about the rise and fall of ancient Egypt presented the pectoral of Princess Mereret from the 12th Dynasty manufactured from gold, turquoise, carnelian and lapis lazuli, a pectoral for Tutankhamun with lapis lazuli scarab and other semiprecious stone elements such as cobras and sun symbols, the golden throne of Tutankhamun inlaid with semiprecious stones [3].

Abdel-Mageed and Ibrahim (2012) studied the ancient Egyptian colors as a contemporary fashion. They presented a pectoral scarab containing semiprecious stones such as

carnelian, obsidian and lapis lazuli, bracelet including lapis lazuli and green stone (!), a scarab pectoral of Tutankhamun including lapis lazuli and carnelian and another one using carnelian, a necklace including lapis lazuli and green feldspar and a Royal diadem using carnelian [4]. Nawar (2013) in his study of the historical foundations of science and technology in Egypt presented pectorals of Pharaoh Tutankhamun including semiprecious stones (!) [5]. Kharbush and Andras (2014) stated that the ancient Egyptian mines were the main sources for gemstones in ancient Egypt. They outlined that peridot mining was as early as 1500 BC from the St. Jones Island in the Egyptian Red Sea and Egypt was the only source of emerald for Europe and the Mediterranean region [6].

Hassaan (2016,2017) in his investigation of mechanical engineering in ancient Egypt presented artifacts including carnelian, turquoise, lapis lazuli, garnet and agate in producing amulets and necklaces [7,8], carnelian cat bezel from the Third Intermediate Period [9]. He presented also artifacts including some semiprecious stones from the 12th, 17th and 18th Dynasties [10]. James and Dorman (2017) in their article about the Egyptian art presented the golden funerary mask of Pharaoh Tutankhamun from the 18th Dynasty. They stated that the mask was inlaid by lapis lazuli and colored glass. They presented also gold

pectoral for King Senusret III from the 12th Dynasty inlaid by a number of semiprecious stones, a pectoral for Pharaoh Tutankhamun inlaid by semiprecious stones [11].

National Museums Scotland (2017) in their work about ancient Egypt handling box presented a carnelian amulet in the shape of the djed-pillar from the New Kingdom (1550-1292 BC), olive green and dark green stones heart scarab from the New Kingdom (1295-1069 BC) [12].

SEMPIPRECIOUS STONE PRODUCTS IN THE PRE-DYNASTIC PERIOD

Because they were a highly civilized nation, they knew the outstanding mechanical and chemical properties of the semiprecious stones. Besides they could get such valuable materials and use it from as early as 3000 BC and even before. Here are some uses of the ancient Egyptians of semiprecious stones referred to their associated time era:

- The first example is a bone figurine from Naqada I (4000-3500 BC) with lapis lazuli eyes in display in the British Museum and shown in Fig.1 [13]. The artisan of the ancient Egyptians cut almost circular pieces of lapis lazuli and used them as eyes for his bone figurine. The designer preferred to use the lapis lazuli eyes as a glass having almost circular profile as what happens nowadays. He carved the bone on the woman face to house the eyes. The high technology here is to select a proper adhesive to keep the stone in position in the for more than 5500 years without dropping away.
- The second example is a wooden statuette from Naqada I-Naqada II (3700-3200 BC) with lapis lazuli eyes recently unearthed in Egypt and shown in Fig.2 [14]. Here, the designer preferred to use the lapis lazuli eyes simulating exactly human eyes. The solero had an almost ovoid shape and there was a pupil in its centre. Again, the lapis lazuli eyes could stay in position for more than 5200 years and the artisan could select a black pupil withstanding the severe environmental effects for thousands of years.



Figure1. Bone figurine from Naqada I [13]



Figure2. Wooden figurine from Naqada I-II [14]

SEMPIPRECIOUS STONE PRODUCTS IN THE EARLY DYNASTIC PERIOD

This period came immediately after the Predynastic one and comprises the first and second dynasties over a time period from 3100 to 2686 BC. Here we present an outstanding application of using semiprecious stone in inlaying jewellery. The application is a set of bracelets of King Djed from the 1st Dynasty (3000 BC) in display in the Egyptian Museum at Cairo and shown in Fig.3 [15]. The Djed set of bracelets contains various designs and sizes of beads. The beads were produced from lapis lazuli, turquoise and amethyst. The beads were assembled in single or three strands.



Figure3. Bracelets of King Djed from the 1st Dynasty [15]

SEMPIPRECIOUS STONE PRODUCTS IN THE OLD KINGDOM

This historical period comprises 3rd to 6th Dynasties over a time period from 2686 to 2181 BC. We have one example from this period which is a 20 mm carnelian amulet in the shape of a human leg from the Old Kingdom period 2686-2134 BC in display in the Brooklyn Museum and shown in Fig.4 [16]. All the surfaces were polished and the whole small unit had rounded ends not to harm the uses reflecting an outstanding ancient Egyptian mechanical engineering design tradition.



Figure4. Carnelian leg amulet from the Old Kingdom [16]

SEMPRECIOUS STONE PRODUCTS IN THE MIDDLE KINGDOM

This period covers the 11th and 12th Dynasties over a time period from 2133 to 1800 BC. According to investigations while studying the mechanical engineering in ancient Egypt, the 12th Dynasty is one of the wealthy dynasties during the ancient Egyptian history and they presented products having relatively high technology in material selection, design and production. We have good examples presenting their use of semiprecious stones within some of their products as depicted by the following examples:

- The first example is an 18 mm width carnelian Wadjet eye amulet from the 8th – 12th Dynasties (2150-1950 BC) in display in the Metropolitan Museum of Art and shown in Fig.5 [17]. Even though the amulet was relatively small, the carver could carve it neatly, round all the corners, polish it and decorate it using patterns base only on straight line segments.



Figure5. Carnelian Wadjet amulet from 8th – 12th Dynasties [17]

- The second example is a lapis lazuli headdress for a statue for Isis produced during the Middle Kingdom (2133-1797 BC) sold by Bonhams in April 2010 for 4,753 US\$ and shown in Fig.5 [18]. The lapis lazuli headdress of blue color is simulating an actual headdress through the patterns carefully carved on its external surface. The designed added three colors diadem on the top part of the headdress with a strand representing a cobra with extra blue color.



Figure6. Lapis lazuli from the Middle Kingdom [18]

- The third example is a 480 mm length necklace with carnelian, agate and lapis lazuli beads produced during the 11th Dynasty (2000 BC), displayed by Ebay (UK) for sale and shown in Fig.6 [19]. This is a wonderful piece manufactured completely from semiprecious stones in the shape of beads having various sizes in shape, diameter and length. The lengthy beads were isolated from each others using small multi-colors beads. In the middle of the necklace comes the biggest carnelian bead while the longest beads comes at the terminals of the necklace.



Figure7. Necklace from the 11th Dynasty [19]

- The fourth example is a 295 mm length necklace of beads manufactured from amethyst, carnelian, lapis lazuli, gold and green faience from the 12th Dynasty (1950-1885 BC) shown in display in the Metropolitan Museum of Art and shown in Fig.7 [20]. The manufacturer used five different materials in producing this necklace three of them were semiprecious stones. The beads had different design shape and dimensions. Bigger beads were isolated from each other by small ones of different materials for about 70 % of the necklace length.



Figure8. Necklace from the 12th Dynasty [20]

- The fifth example is an amethyst fish amulet from the 12th Dynasty (1938-1795 BC) which was a gift of Mohammed Khamis and the Oriental Weavers to the Michael Carlos Museum of the University of Emory at Georgia and shown in Fig.8 [21]. The designer in this amulet simulated a Tilapia Egyptian fish showing its eyes, fins tail and

even its peel. He put a ring in its mouth for hanging. All this was carefully carved on a piece of amethyst with all surfaces clearly rounded not to harm the user !! .

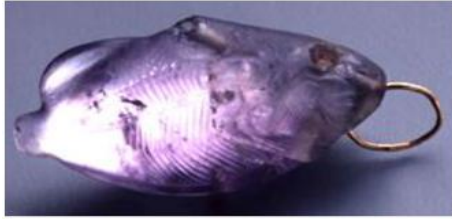


Figure9. Amethyst fish amulet from the 12th Dynasty [21]

- The sixth example is an 820 mm length necklace of Princess Sithathoryunet with inscribed name of King Senwoseret II from



Figure10. Necklaces from the 12th Dynasty [22]

- The seventh example is a 17 mm length finger-ring of Princess Sithathoryunet daughter of King Senwoseret II from the 12th Dynasty (1887-1878 BC) found at Lahun of Fayum , in display in the Metropolitan Museum of Art at NY and shown in Fig.11 [24]. This finger-ring was produced from gold inlaid by carnelian, lapis lazuli and turquoise , all forming a dynamic bezel of an scarab shape. The arrangement and assemble of the nine pieces of the scarab are more than wonderful reflecting the high technology of this industry during the 12th Dynasty.
- The eighth example is a 17 mm height clasp of Princess Sithathoryunet daughter of King Senwoseret II from the 12th Dynasty (1887-1878 BC) found at Lahun of Fayum , in display in the Metropolitan Museum of Art at NY and shown in Fig.12 [25]. This clasp was manufactured from gold, lapis lazuli, turquoise and glass in a wonderful carving and assembly. .



Figure11. Finger - ring from the 12th Dynasty [24]

the 12th Dynasty (1887-1878 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.9 [22]. They produced this wonderful master piece of jewellery in the 12th Kingdom using gold, carnelian, lapis lazuli, turquoise and garnet in a very complex design requiring very high technology to assemble and fasten all the too many elements of this amazing piece of jewellery (372 pieces [23]). The strand was composed of conical beads of different materials and colors with small beads separating the bigger ones. The width of the two Horus pectoral was 82 mm.



Figure12. Clasp from the 12th Dynasty [25]

- The ninth example is a 365 mm length pectoral for Princess Neferuptah, daughter of King Amenhotep III of the 12th Dynasty (1860-1814 BC) in display in the Egyptian Museum at Cairo and shown in Fig.13 [26]. This wonderful pectoral consisted of six adjacent strands of cylindrical beads ended by a golden falcon from both ends. Large number of amulets are gathered in the outside row with very thin straps of yellow beads. The pectoral strap was decorated by two-colors alternating thin beads while the grasp took the shape of a falcon head with six rows of beads ended by a row of amulets. The designer used feldspar and carnelian in producing the beads and amulets.



Figure13. Collar from the 12th Dynasty [26]

- The tenth example is a carnelian bezel finger-ring for Prince Amenhotep III from the 12th Dynasty (1847-1798 BC) shown in Fig.14 [27]. I could not trace the present location of this finger-ring. The bezel was carefully carved and inscribed by a scene for the Prince setting on a chair with a food-table in front of him. The four corners of the bezel were carefully rounded reflecting the ancient Egyptian tradition in mechanical design.



Figure14. Carnelian bezel from the 12th Dynasty [27]

SEMPRECIOUS STONE PRODUCTS IN THE NEW KINGDOM

The New Kingdom comprised the 18th, 19th and 20th Dynasties over a time span from 1543 to 1069 BC. This kingdom was the most powerful and wealthy period in the ancient Egyptian History and we expect to find wonderful examples of using semiprecious stones in different artifacts as depicted by the following examples:.

- The first example is a gold and carnelian necklace from the 18th-19th Dynasties (1550-1196 BC) sold by Christies on June 1999 at NY for 13,800 US\$ and shown in Fig.15 [28]. The designer selected spherical carnelian beads separated by pendants in the shape of a lotus-puds. The four beads in the center of the necklace had a different design shape and material (gold) with another pendant type of two elements in series.

- The second example is an alabaster and lapis lazuli trumpet from the 18th Dynasty (1550-1307 BC) shown in display (probably) in the Egyptian Museum at Cairo and shown in Fig.16 [29]. The designer outlined his trumpet to consist from seven pieces, three alabaster pieces including the bell and three lapis lazuli similar pieces. The trumpet mouth may be from a third material or from alabaster but with different color. The arrangement of the pieces gave a beauty for the trumpet with an important question about the jointing of the pieces with each other.



Figure15. Necklace from 18th – 19th Dynasties [28]



Figure16. Trumpet from the 18th Dynasty [29]

- The third example is an 18 mm internal diameter golden finger-ring with jasper and lapis lazuli inlays from the New Kingdom (1550-1077 BC) sold by Time Line Auctions at London for 21,173 US\$ and shown in Fig.17 [30]. The designer designed the bezel to house patterns of semiprecious stone pieces of different designs and colors. Gold bands were used to separate the semiprecious pieces from each other.
- The fourth example is a gold and green jasper heart scarab for Djehotety, General of Pharaoh Thutmose III of the 18th Dynasty (1490-1436 BC) in display in the Egyptian Museum at Cairo and shown in Fig.18 [31]. The jasper body of the scarab was inscribed in ten parallel bands separated by straight lines while it was housed inside a golden frame with a hanging ring.



Figure17. Finger – Ring from the New Kingdom [30]



Figure18. Jasper from the 18th Dynasty [31]

- The fifth example is a 168 mm length cuff bracelet from the reign of Pharaoh Thutmose III of the 18th Dynasty (1479-1425 BC) in display in the Metropolitan Museum of Art and shown in Fig.19 [32]. This bracelet is from the flexible type and was fantastically produced from 14 strands of beads and a central platform carrying three cats of different colors. The designer used gold, carnelian, lapis lazuli, turquoise and glass as raw materials for his outstanding unit. The number of his dual-conical-beads from right to left are: 15, 3, 15, 8, 15, 15, 15, 15, 3, 15, 8, 15, 15 and 15. He used a golden clasp at the terminals of the bracelet. The were two empty trays in the middle of the bracelet may be for another two missing cats..



Figure19. Cuff bracelet from the 18th Dynasty [32]

- The sixth example is a 25 mm height lapis lazuli falcon inlay from the New Kingdom (1450-1185 BC) in display in the Walters Art Museum at Boston and shown in Fig. 20 [33]. The carver could show all the details of the falcon in a relatively small area.
- The seventh example is a carnelian Tilapia-fish-amulet from the 18th Dynasty (1450-1300 BC) in display in the Walters Art Museum and shown in Fig.21 [34]. Even

though, the carnelian has a moderate hardness (6-7 on Moh's scale) the carver could show all the details of the fish including mouth, eyes, gills, fins and peel.



Figure20. Falcon inlay from New Kingdom [33]



Figure21. Fish - amulet from the 18th Dynasty [34]

- The eighth example is a 65 mm width carnelian plaque from reign of Pharaoh Amenhotep III of the 18th Dynasty (1390-1352 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.22 [35].The plaque had an elliptical shape with special shape at the ends (may be for connection with other elements or for use as a pendant). The designer presented a very busy carved scene for the Pharaoh and his wife carved twice with cartouches setting in a Nile River decorated-boat.



Figure22. Carnelian plaque from the 18th Dynasty [35]

- The ninth example is a winged-scarab-amulet for Pharaoh Tutankhamun of the 18th Dynasty (1333-1323 BC) in display in the Egyptian Museum at Cairo and shown in Fig.24 [36]. This wonderful and complex amulet was manufactured from gold, lapis lazuli (the scarab), carnelian (the sun) and other semiprecious stones (the wings and river-boat). The designer showed the scarab standing on two of its legs in the boat,

spreading its wings and holding the sun-disc by its front legs and wings. The wings had a very complex design with wonderful combinations of the semiprecious stones simulating the feathers of the wings.

- The tenth example is a golden bracelet with lapis lazuli scarab for Pharaoh Tutankhamun of the 18th Dynasty (1333-1323 BC) in display in the Egyptian Museum at Cairo and shown in Fig.24 [37]. The bracelet was inlaid by a number of semiprecious stones and has a craps jointing its two parts together. However, it is not clear if there is a revolute joint or not. The scarab was decorated by thin bands of gold and all the surfaces are shining and rounded.



Figure23. Falcon inlay from New Kingdom [36]



Figure24. Royal bracelet from the 18th Dynasty [37]

- The eleventh example is a double cartouche cosmetic container for Pharaoh Tutankhamun of the 18th Dynasty (1333-1323 BC) in display in the Egyptian Museum at Cairo and shown in Fig.25 [38]. The container was inlaid with carnelian and colored glass. It was decorated by a scene in the front (and may be in the back) cartouche faces, a sun-disc and two feathers on each cartouche. The feathers are manufactured from four different materials of different colors.
- The twelfth example is a gold and carnelian ring of Pharaoh Ramses II from the 19th Dynasty (1279-1213 BC) in display in the Louvre Museum at Paris and shown in Fig.26 [39]. The ring-bezel was inscribed by the cartouches of Ramses II and his Great Royal Wife Nefertari. All the surfaces of the ring were finely polished and rounded specially the loop of the ring.



Figure25. Cosmetic container from the 18th Dynasty [38]



Figure26. Royal ring from the 19th Dynasty [39]

- The thirteenth example is a 32 mm length lapis lazuli seal of Pharaoh Ramses II from the 19th Dynasty (1279-1213 BC) in display in the Virtual Egyptian Museum, California Institute of World Archaeology, California and shown in Fig.25 [40]. The seal took the shape of the Pharaoh cartouche with his inscription on its face. Moreover, all the surfaces were carefully rounded as the tradition of the Mechanical design in ancient Egypt.
- The fourteenth example is a 22 mm height carnelian amulet in the shape of a setting child from the 19th-20th Dynasties (1292-1069 BC) in display in the Louvre Museum and shown in Fig.26 [41]. The carnelian was finely carved, polished and given rounded surfaces everywhere.



Figure27. Lapis lazuli seal from the 19th Dynasty [40]



Figure28. Carnelian amulet from the 19th –20th Dyn[39]

SEMPRECIOUS STONE PRODUCTS IN THE THIRD INTERMEDIATE PERIOD

This period comprises the 21st to 25th Dynasties over a time span from 1070 to 664 BC. We have a number of examples on semiprecious stones applications presented as follows:

- The first example is a golden finger-ring with carnelian cat bezel from the 3rd Intermediate Period (1070-664 BC) in display in the British Museum and shown in Fig.27 [42]. The bezel was of the dynamic type since the designer used two revolute joints of golden housing to allow the bezel to rotate. The bezel was completely carved from one piece of carnelian, polished and rounded not to harm the user.
- The second example is swing finger-ring with Wadjet-eye including lapis lazuli from the reign of Pharaoh Psusennes I from the 21st Dynasty (1047-1001 BC) in display in the Egyptian Museum at Cairo and shown in Fig.28 [43]. The bezel consisted of a golden rectangular frame housing the semiprecious wadjet eye in two colors. The corners of the bezel were carefully rounded not to harm the user in a wonderful mechanical engineering tradition.
- The third example is a 70 mm height golden bracelet inlaid with lapis lazuli, carnelian and green feldspar for Pharaoh Psusennes I of the 21st Dynasty in display in the Egyptian Museum at Cairo and shown in Fig.29 [44]. This is a wonderful master piece of the ancient Egyptian jewellery. The designer decorated the Pharaoh bracelet by a winged scarab standing on its back legs, holding the 'shen' symbol between its legs, holding the sun-disk between its front legs and spreading its two wings vertically. The scarab was produced from lapis lazuli, the shen was produced from green jasper, the carnelian, lapis lazuli and jasper was used in producing the scarab wings.
- The fourth example is a golden bracelet inlaid with lapis lazuli, carnelian and white faience bracelet of Pharaoh Sheshonq II of the 22nd Dynasty (887-885 BC) in display in the Egyptian Museum and shown in Fig.30 [45]. The bracelet was decorated by a wadjet eye on a River boat between four columns manufactured using different materials of different colors.



Figure29. Finger – ring from 3rd IP [42]



Figure30. Finger – ring from the 21st Dynasty[43]



Figure31. Bracelet from the 21st Dynasty[44]



Figure32. Bracelet from the 22nd Dynasty[45]

- The fifth example is a 77 mm height golden pectoral with carnelian, lapis lazuli and feldspar inlay of Pharaoh Sheshonq II of the 22nd Dynasty (887-885 BC) in display in the Egyptian Museum and shown in Fig.31 [46]. The pendant had a rectangular golden shape decorated by a sun-boat scene with sun produced from lapis lazuli, two golden Horus figurines on the top edges of the pectoral and a number of hanged amulets in the form of lotus flowers and puds under the pectoral produced from gold, feldspar and (probably) turquoise.
- The sixth example is a 50 x 50 mm lapis lazuli pendant inlaid by gold for goddess

Hathor from the 22nd Dynasty during the reign of Pharaoh Osarkon II (872-837 BC) in display in the Egyptian Museum at Cairo and shown in Fig.32 [47]. The pendant was carved from a single piece of lapis lazuli, then inlaid by gold for the eyebrows, eye and headdress bands.

- The seventh and last example is a 60 mm height red jasper Isis knot amulet from reign of Piankhy from the 23rd-24th Dynasties of the Nubian Napatan Period (743-712 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.33 [48]. This amulet was carefully carved from one jasper piece with all the surfaces rounded with decorations in the form of lines and some curves.



Figure33. Pectoral from the 22nd Dynasty[46]



Figure34. Hathor from the 22nd Dynasty[47]

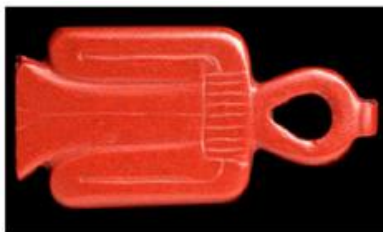


Figure35. Isis knot from the 23rd - 24th Dynasty[48]

SEMPRECIOUS STONE PRODUCTS IN THE LATE PERIOD

The Late Period comprises the 26th to 30th Dynasties over a time span from 664 to 343 BC. We have two examples from the Late Period presented as follows:

- The first example is a 20 mm height lapis lazuli falcon amulet from the Late Period (664-332 BC) sold by Bonham on July 2016

for 3,300 US\$ and shown in Fig.34 [49]. The designer put two falcons beside each other showing the details of their body and head.

- The second example is a 52 mm height lapis lazuli statue of Ptah from the 26th Dynasty (945-600 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.35 [50]. The carver could produce a complete standing statue for Ptah wearing a wide pectoral, having a long thin beard and holding a sceptre and standing on a parallelogram base from the same material. The details of the face and top part of the statue are depicted in the zoomed image in Fig.35.



Figure36. Amulet from the Late period [49]



Figure37. Ptah statue from the 26th Dynasty[50]

CONCLUSION

- The evolution of mechanical engineering during the ancient Egypt history was investigated in through the manufacturing of semiprecious products.
- The ancient Egyptians new the semiprecious stones from very early times. They used lapis lazuli to make eyes for their figurines as early as 4000 BC, i.e. from more than 6000 years ago.
- They used semiprecious stones to produce single and multi-strands bracelets during the 1st Dynasty (more than 5000 years ago).
- They used carnelian in the Old Kingdom and Middle Kingdom to produce some of their amulets.

- They used lapis lazuli in the Middle Kingdom a headdress for an Isis statue
- They produced carnelian, agate and lapis lazuli beads of various designs for their necklaces during the 11th Dynasty.
- They produced amethyst, carnelian and lapis lazuli beads during the 12th Dynasty.
- They used amethyst in producing some of their amulets during the 12th Dynasty.
- The surfaces of their semiprecious stones products were highly polished and rounded to avoid any harm for the user.
- During the 12th Dynasty, they produced an 0.82 m length necklace for Princess Sathathor using gold inlaid by carnelian, lapis lazuli, turquoise and garnet including 372 pieces.
- They used carnelian, lapis lazuli and turquoise to inlay gold finger-rings and clasps during the 12th Dynasty.
- They used feldspar and carnelian in producing cylindrical beads for multi-strands collars during the 12th Dynasty.
- They designed inscribed carnelian bezels for finger-rings during the 12th Dynasty.
- They used carnelian amulets in the shape of lotus-puds to interchange with spherical beads in necklaces from the 18th-19th Dynasties.
- They used alabaster and lapis lazuli in producing trumpet elements.
- They used jasper and lapis lazuli to inlay golden finger-rings during the New Kingdom.
- They used green jasper in producing inscribed heart scarabs during the 18th Dynasty.
- They used 14 strands of beads manufactured from carnelian, lapis lazuli, turquoise and glass for a flexible bracelet during the 18th Dynasty.
- Their use of carnelian in producing amulets continued down to the 20th Dynasty.
- They used carnelian for the production of inscribed plaques during the 18th Dynasty.
- They used lapis lazuli, carnelian and other semiprecious stones in producing wonderful jewellery for Pharaoh Tutankhamun of the 18th Dynasty.
- They used carnelian and colored glass to inlay cosmetic container during the 18th Dynasty.
- They used carnelian to produce finger-rings during the 19th Dynasty.
- They used lapis lazuli to produce a Royal seal during the 19th Dynasty.
- They continued to use carnelian and lapis lazuli in the production of finger-ring bezels during the Third Intermediate Period.
- They continued to use carnelian, lapis lazuli and green feldspar to inlay golden bracelets during the 21st and 22nd Dynasties.
- Lapis lazuli was used alone to produce pendants inlaid by gold during the 22nd Dynasty, amulets during the Late Period and statues during the 26th Dynasty.

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