BANGKOK Gems & Jewellery

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'NANOSITAL' – The Jewel That Was Anticipated

'Nanosital' was developed in 2013 by the specialists of the Rusgems group of companies. 'Nanosital' belongs to the group of materials that are called glass-ceramics. Materials of that kind contain very small (nanosized) crystals framed by a glass matrix. In other words, a glass-ceramics is the combination of glass and monocrystals.

Glass-ceramics was first developed in the 1950s. Nowadays there are dozens of such materials. All of them differ in the chemical structure that defines their main characteristics. While working on 'Nanosital,' the Rusgems specialists aimed at creating the material that would exhibit characteristics that are most suitable for imitation of most popular gemstones, which are: high refractive index and high dispersion that provide excellent brilliance with a great light-play; value of 7 on the Mohs scale of hardness; wide range of colours and high melting point (above 1500 degrees Celsius). To achieve all of those qualities a particular chemical structure was chosen. That is this precise chemical structure that makes 'Nanosital' so unique and makes it different from all the other glass-ceramic materials that don't possess the full set of the above characteristics.

In the table below, 'Nanosital' is compared to other jewellery materials both synthetic and natural.

Comparison Table of Physical Properties of Nanosital by Rusgems Company and Other Jewellery Stones

Physical characteristics	Glass	Cubic Zirconia	Quartz	NANOSITAL	Topaz	Corundum
Mohs hardness	5-5,5	8-8,5	7	**7**	8	9
Refraction index	1,45-1,54	2,17	1,54	**1,65-1,7**	1,62	1,76
Density, g/cm^3	2,2-2,6	5,9-6,3	2,65	**3,2-3,8**	3,56	3,99
Dispersion (effects of light)	0,005-0,007	0,060	0,013	**0,015**	0,014	0,018
Melting point, °C	600-700	2800	1700 (demolition of crystal under 570°C)	**1700**	1800	2050
Processing problems	It's too mild. It's difficult to get ideal polishing without small scratches	There are often small scratches which are difficult to take off.	Difficult technology of polishing using polyrite.	**Well polished on diamond grinding point 3/2.**	Well polished on diamond grinding point 3/2.	It's difficult to produce the ideal half-boule. It's very hard. There is fast abrasion wear.
Color steadiness when heated (the possibility of using wax casting)	No	No	No	**Yes**	No	Yes

Nanosital Sapphire

Commentaries on the table:

1. 'Nanosital's' density values are close to those of the most popular jewellery gemstones such as topaz, sapphire, ruby, aquamarines, etc. 'Nanosital' has an optimal weight (density 3,2-3,8 g/cc): it's not so heavy as Cubic Zirconia (6 g/cc) and not so light as glass (approx. 2 g/cc).

2. 'Nanosital' has the same optical properties as the best of the coloured gemstones. While there is no exaggerated unnatural shine, which is typical for Cubic Zirconia and some other synthetic materials, the difference from the cheap and primitive glass that has almost no 'light-play' is clear to the consumer.

3. Hardness is the best possible for processing of the material and provides limitless durability for items with 'Nanosital' while the appearance remains the same over the years. 'Nanosital' (7 Mohs) is harder than very soft jewellery glass and softer than very hard corundum. Such qualities make it possible to achieve a gemstone of any size (from the smallest to the largest) without any differences. As a matter of fact, 'Nanosital's' hardness is similar to quartz, but unlike quartz 'Nanosital' is easy to polish.

4. High melting temperature enables applying the wax casting technique to any coloured 'Nanosital.' It will be recalled that all the types of glass and quartz and some types of coloured Cubic Zirconia could not be heated to a high temperature (above 800 degrees Celsius).

5. Colour and transparency. Absolute transparency and absence of internal defects such as impurities, haze and striae (optical imperfections) are what makes 'Nanosital' the excellent jewellery raw material. Furthermore, 'Nanosital' provides a wide range of colours — more than 80 colours so far. It is important to notice that the Rusgems specialists always achieve 100% similarity to the colour of the natural prototype. If you put a natural gemstone and its imitation made of 'Nanosital' next to each other, it would be impossible to tell the difference.

There is a special group of 'Nanosital' that includes stones that are opaque (it's called milky) and semi-transparent — opals. Such stones are getting more and more popular. 'Nanosital' colours that are among leaders: turquoise, lapis, jadeite and chrysoprase. Next favourites are fire opal and pink opal. Our customers mainly use our material to obtain small-sized gemstones that are then used in jewellery items made with wax casting techniques. 'Nanosital' is the only material that allows doing so. All the other materials that are used to imitate the colours listed above can't stand high temperatures.

Another advantage of 'Nanosital' is the fact that when a gemmological tester is applied to its non-transparent varieties, the result is 'jadeite' or 'chrysoprase.' Along with similarity in structure, appearance and colour it certainly increases distribution of such imitations.

Nowadays Rusgems produces around 3 tons of

'Nanosital' a month. Due to the growing demand in the market, we constantly increase production output.

Even in the low-end market segment, 'Nanosital' replaces coloured Cubic Zirconia, quartz and corundum at an ever-increasing pace. This refers to such colours as pink, yellow, lavender, peridot and so on.

Our customers have come to appreciate the advantages that 'Nanosital' has over the other synthetic jewellery materials. Unlike those materials, 'Nanosital' wasn't formed by accident but was developed as a result of intentional efforts to put together all the best consumer properties that are most in-demand in the jewellery market.

Moreover, the level of 'Nanosital's' colour reproducibility from batch to batch is significantly higher compared to other materials, which is very important as far as production of large batches of gemstones is concerned.

As an example let's compare synthetic blue corundum (international name: Corundum #34; #33) and 'Nanosital' of the same colour. The colour of blue sapphire is among the most popular ones and corundum was always known as the most appropriate imitation of it. Until 'Nanosital' was developed. Problems related to processing of blue corundum are well-known:

1. Very high hardness (9 Mohs), and therefore excessive wear of processing tools.

2. Unevenness of the crystal's colour that leads to the low yield of gemstones. Only the edges (no more than 2-3 mm) are coloured, the remaining part is colourless.

3. The crystals (boules) themselves have small size and hemispherical shape that is inconvenient to mark out, which restrains the production of big-sized gemstones.

4. Permanent shortage of dark-coloured crystals on the market due to the difficulties related to their production.

5. High price (up to $450/kg).

All of the above-mentioned disadvantages lower the yield rate and obviously increase the price of the finished cut from corundum.

'Nanosital' is a material that lacks all these drawbacks. Hardness (7 Mohs); consistency and stability of colour in a piece and from batch to batch; big pieces that make it possible to obtain gemstones of absolutely any size from the smallest to the biggest; the colour is absolutely(!) similar to corundum ; the price is almost twice lower.

Comparison Table Nanosital and Synthetic Corundum Sapphire (Switzerland)

	Nanosital A475, A1582	Corundum #34, #35
Color	Blue sapphire	Blue sapphire
Price of the raw material, $/kg	250	400
Yield of finished cut stones Ø2mm from1kg of raw material	12000-15000	3500-4000
Average price of cut stones Ø2mm, $/pc	0.07	0.2*

*** The prices are calculated taking into account the reject based on colour after cutting.**

Now it can be seen that it is much more advantageous to use 'Nanosital' than synthetic corundum, not to mention natural sapphire. Furthermore, colour, brilliance and weight have almost no differences. That's why customers increasingly prefer coloured 'Nanosital.'

This is particularly relevant these days during the period of global economic crisis. Not so many people seem to care whether the gemstone in the jewellery item is natural or synthetic. Top priority is how the item looks (!). Does it look beautiful and natural or not? Still, the main question is without a doubt, 'what's the price?' Nowadays a customer in the jewellery store would rather prefer an item containing 'Nanosital' because it's where "the quality meets the price." At the end of the day, nobody buys a piece of jewellery, because the tag says natural sapphire, or blue corundum, or blue 'Nanosital.' What defines the choice are aesthetic qualities (beauty, design and so on), durability and, of course, financial capacities. ''Why pay more when blue 'Nanosital' looks exactly like natural sapphire?'' — that's what a contemporary consumer is considering while standing at the shop counter.

Consumer properties of 'Nanosital' fully meet current demands in the jewellery market: beautiful coloured gemstones indistinguishable from natural ones that have optimal hardness for processing and long-term usage. And add to that, prices are rather democratic and competitive.

'Nanosital' is the reasonable choice of practical people.