



June 5, 2013

**Filed Electronically**

Federal Trade Commission  
Office of the Secretary  
Room H-113 (Annex O)  
600 Pennsylvania Ave NW  
Washington, DC 20580

Re: Jewelry Guides Roundtable, 16 CFR Part 23, Project No. G711001

Gemesis, Inc. (“Gemesis”) is pleased to provide the following comment in response to the Federal Trade Commission’s (“FTC”) Request for Public Comments dated May 6, 2013. The FTC’s current request relates back to its July 2, 2012 Request for Public Comments, in which the Commission sought information regarding, among other things, the following issues: ...

(10) What modifications, if any, should be made to the Guides to account for current or impending changes in technology or economic conditions affecting the jewelry and precious metals industries? ...

(19) Does use of the term “cultured,” together with qualifying terms such as “laboratory created,” “laboratory grown,” “[manufacturer name]-created,” or “synthetic,” to describe laboratory-created diamonds or other gemstones that are optically, chemically, and physically equivalent to natural, mined stones of the type identified create confusion among consumers or cause consumer injury? ...

(20) Should the Guides be amended to address specifically whether and in what circumstances the term “cultured” may be used to describe diamonds or other gemstone products? If so, what guidance should be provided?

There have been significant technological and economic advancements relating to lab-grown diamonds since the Commission's 2006 update to the Jewelry Guides. These advancements, including improved diamond quality and expanded scientific, and high tech uses, have significant commercial and consumer value.

These potential benefits, however, are hindered by consumer misunderstanding about lab-grown diamonds. This misunderstanding does not stem from use of the term "cultured," however. The term "cultured" accurately describes the process by which lab-grown diamonds are formed and would help clarify for consumers the difference between mined diamonds, lab-created diamonds, and truly artificial stones such as cubic zirconia. The Commission should address this issue in the guides by specifying that "Cultured," "Grown," "lab-grown," or "lab-created" are appropriate qualifiers only for grown diamonds because they are grown by the natural process of "crystallization" of carbon and have identical chemical, physical and optical properties as diamonds.

The consumer confusion that exists today is largely due to the term "synthetic". This term, which the Commission has acknowledged is confusing, does not explain to consumers how lab-grown diamonds are grown. It is this lack of specificity inherent in the term that allows certain competitors to create the impression in the market that "synthetic" is synonymous for "fake". The Commission should remove the term "synthetic" as an appropriate qualifier for lab-grown diamonds because it is open to interpretation and misused by competitors to create confusion. Further discussion of these issues is set forth below.

## **I. Lab-Grown Diamonds Benefit Industry and Consumers**

Recent technological advancements have refined the properties of single-crystal, colorless lab-grown diamonds to be identical or even superior to mined colorless diamonds. A mined diamond is formed by re-crystallization of carbon, a process in which carbon atoms bond to each other, growing into a tetrahedral structure where each carbon atom is bonded to four other carbon atoms, resulting in diamond growth. To accomplish the same natural re-crystallization process above ground, scientists developed two techniques to grow single crystal diamonds:

- (a) High pressure High Temperature (HPHT) technique; and
- (b) Chemical Vapor Deposition (CVD) technique using microwave plasma (MPCVD).

The MPCVD process, described more fully in Section II, in particular has advanced the science of grown diamonds substantially in recent years. Process improvements have enabled scalable and sustainable production of grown single-crystal, colorless diamonds for the first time in human history. These developments allow the MPCVD technique to grow high quality diamonds that has expanded the application horizon of grown

diamonds to gem, scientific, and high tech applications. These advancements were chronicled in a 2013 report produced by Frost & Sullivan,<sup>1</sup> which notes the following:

The recent technological advancements in the processes of growing diamond using MPCVD technique have ensured that the properties of single-crystal, colorless lab-grown diamonds thus formed, are identical or superior to the earth-derived colorless diamonds.

The diamonds thus produced are high-quality Type IIa (gem-quality) diamonds. Type IIa diamonds are a rare form of diamond, as less than two percent of earth-derived diamonds are Type IIa. Such single-crystal diamonds formed using MPCVD technology can, in fact, be compared to the rarest of earth-derived diamonds.

The consistent availability of high-quality, single-crystal diamonds has led to grown diamonds being accepted for gem applications. Even though it will take time to generate substantial market traction, jewellery designed using lab-grown diamonds is available and is being sold by both online and brick-and-mortar retailers.

The availability of jewellery designed using grown diamonds adds on to the choices that the end-consumers will have while shopping for their treasured diamond possession. Industry players producing and selling lab-grown diamonds are taking suitable measures to ensure that end-consumers are well aware of the origin of their diamonds, thus empowering the end-consumer in making an informed choice. Manufacturers and distributors have included lab-grown diamond related education sections on their portals. In accordance with general mined diamond industry practice, grown diamond producers are also providing certificates by gemological labs for their grown diamonds.

Frost & Sullivan also note significant advancements in the industrial, scientific, and high-tech sectors as follows:

Lab-grown CVD diamonds are gaining increased applicability in the following sectors: thermal, electrical, electrochemical, optical, and mechanical applications. Further, the recent technological advancements in the processes of growing diamond using MPCVD technique look to change this current situation. These technological advancements have paved way for a consistent supply of high-grade gem-quality diamonds with desired properties for scientific and high-tech applications.

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<sup>1</sup> Grown Diamonds - Shaping Future of Diamond Industry. <http://www.frost.com/sublib/display-market-insight.do?id=276747662>

The single-crystal diamond, formed as a result of recent technological advancements in the processes of growing diamond using MPCVD technique, is characterized by extraordinary mechanical properties, and superior optical properties. [According to Yan, et al.] various applications are being developed in the field of abrasive machining, electronics, superconductors, and high pressure research.<sup>2</sup>

In addition to providing gem and commercial applications, these advancements hold significant potential benefit for consumers who are shopping for diamonds. In particular, Frost & Sullivan note that the single crystal colorless diamond offers the following consumer values:

- **Identical to earth-derived diamond:** Unlike diamond simulants such as Cubic Zirconia and Moissanite, lab-grown diamonds are identical to earth-derived diamond in physical, chemical and optical properties. They have the same brilliance, sparkle, fire and scintillation as the earth-derived colorless diamond.
- **Caters to the ecologically-sensitive consumer:** Lab-grown diamonds meet the requirements of those consumers who are wary of their diamond being linked to the ecological and social harms of mining.
- **Rare and pure forms of diamond:** Lab-grown MPCVD diamonds are pure gem-quality diamonds. Some of the industry players have been able to achieve the production of highly pure, Type IIa diamonds as well.
- **By opting for a grown diamond, the consumer gets intrinsic superior quality and purity for a reasonable price.**
- **Informed choice:** Lab-grown diamonds are being certified for their properties by leading gemological institutes. Also, laser-inscription on lab-grown diamonds, indicating their origin, is also becoming an industry practice. Such initiatives empower the end-consumer in making an informed choice while selecting a diamond – whether earth-derived or lab-grown.

These advancements warrant the Commission taking a fresh look at the lab-grown diamond industry and the impact that the misleading use of descriptors like “synthetic” can have on consumer understanding and the industry overall.

## **II. “Cultured” is an Appropriate Term for Lab-Grown Diamonds**

Lab-grown diamonds are diamonds formed as a result of natural growth of a diamond seed into a rough diamond. The Diamond Book of CIBJO (The World Jewelry

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<sup>2</sup> Recent advances in high-growth rate single-crystal CVD Diamonds, by Yan et al; *Diamond & Related Materials* 18 (2009) 698–703.

Confederation) defines a lab-grown diamond as a “man-made reproduction of a diamond that has essentially the same chemical composition, crystal structure and physical properties as its natural counterpart.”

The crystallization of carbon into diamond that takes place inside earth is replicated above the earth using technologies known as HPHT (High Pressure High Temperature) or CVD (Chemical Vapour Deposition) using a suitable source of carbon atoms along with a “Diamond Seed”.

HPHT (High Pressure High Temperature) and CVD (Chemical Vapour Deposition) are two technologies used for growing diamonds. Both the processes entail growing a diamond over a “Diamond Seed” in presence of a suitable source of carbon atoms (gasses or graphite) under appropriate diamond growth conditions.

In both these technologies human role is limited to creating appropriate growth conditions and once the process starts, the re-crystallizations of carbon atoms occurs at an atomic level which is totally driven by laws of nature and cannot be affected or manipulated externally by humans. The entire process is analogous to the process by which pearls are cultured.

#### A. The CVD Process

A CVD process replicates the crystallization of carbon over a diamond seed inside a vacuum chamber. The process requires two gases, first, Methane (CH<sub>4</sub>), the source of carbon inside the vacuum chamber and second, Hydrogen (H<sub>2</sub>) which assists in creating an appropriate environment for growth. The carbon atoms from the CH<sub>4</sub> molecules are split using an intense electric field of 2.45 GHz frequency and find their place on diamond seed atomically to facilitate the growth of diamond.

As in nature, carbon crystallizes on the diamond crystal seed forming a tetrahedral structure identical to that formed below the surface of the Earth. The state of carbon atoms changes from the gaseous state to a solid state resulting in diamond formation. This process occurs at an atomic level and is a purely natural means of diamond formation. Since the growth process cannot be manipulated from outside, a diamond forms in a natural way. Further explanation is attached hereto at Exhibit A.

#### B. The HPHT Process

The HPHT process facilitates diamond growth at very high temperature and pressure comparable to the geological conditions in the earth’s mantle. In this process, temperatures of over 1300 degrees Celsius are maintained along with a pressure of over 50000 atmospheres.<sup>3</sup> In the HPHT process, purified and refined graphite is used as a

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<sup>3</sup> See <http://dneadiamonds.com/creating-man-made-diamonds>

source of carbon. The diamond seed is placed along with graphite capsule in the growth chamber and a catalyst is added.

Under these extreme conditions over the course of many days, the carbon atoms slowly build upon the crystal structure of the diamond seed. The new diamond is cleaned and ready to be cut and polished, just like any other rough diamond. During the growth, the temperature and pressure need to be maintained within a very strict set of parameters. Once again, through the process of crystallization of carbon atoms, a diamond is grown.

The processes by which diamonds and pearls are cultured are identical in terms of the very limited human intervention involved and the replication of the process found in nature. It would therefore be appropriate to refer to a lab-grown diamond using the word ‘cultured’ since:

1. the diamond retains all the physical, chemical and optical properties of diamonds;
2. the growth process is identical to the growth process undergone by any mined diamond;
3. the only human intervention is the plantation of the diamond seed in the growth chamber; and
4. no human intervention or manipulation during the growth phase.

All these factors are also a characteristic of cultured pearls and hence ‘cultured’ is an appropriate term for describing lab-grown diamonds. The Commission should address this issue in the guides by specifying in the Jewelry Guides that “Cultured,” “Grown,” “lab-grown,” or “lab-created” are appropriate qualifiers only for grown diamonds because they are grown by the natural process of “crystallization” of carbon and have identical chemical, physical and optical properties as mined diamonds.

### **III. “Synthetic” is an Inappropriate Term for Lab-Grown Diamonds**

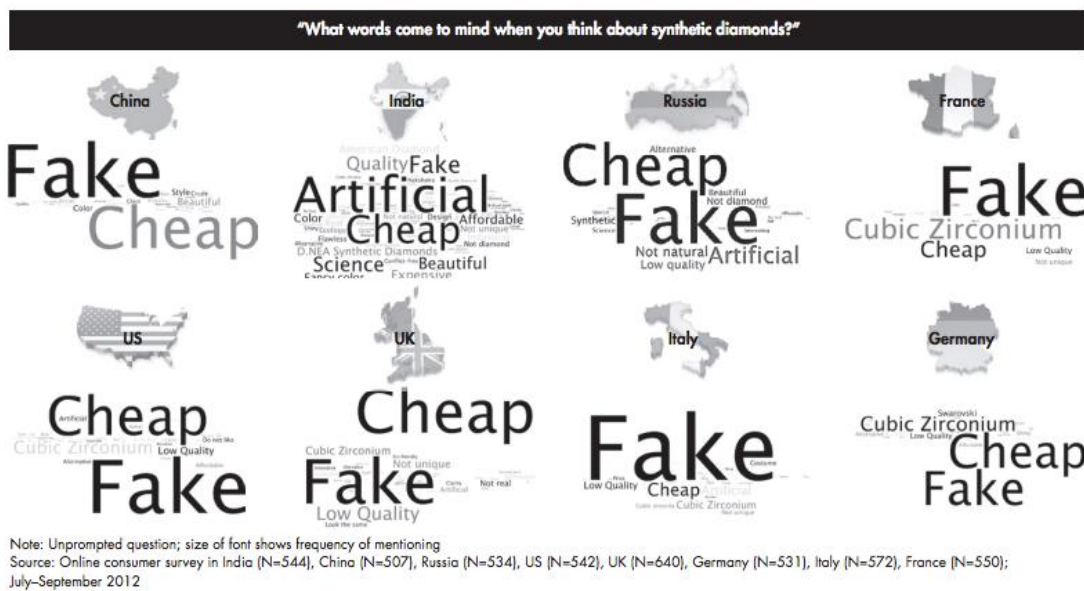
The Jewelry Guides state the following with respect to description of lab-grown diamonds:

§23.23(b): It is unfair or deceptive to use the word “ruby,” “sapphire,” ... or the name of any other precious or semi-precious stone, or the word “stone,” “birthstone,” “gemstone,” or similar term to describe a laboratory-grown, laboratory-created, [manufacturer name]-created, synthetic, imitation, or simulated stone, unless such word or name is immediately preceded with equal conspicuousness by the word “laboratory-grown,” laboratory-created,” “[manufacturer name]-created,” or “synthetic,” or by the word “imitation” or “simulated,” so as to disclose clearly the nature of the product and the fact it is not a natural gemstone.

This provision is unclear, particularly its reference to the term “synthetic,” and the widespread, inconsistent use of the term in the marketplace undoubtedly contributes to

consumers’ confusion. Survey results show that the foremost impression created in many consumers’ minds when they are introduced to a lab-grown diamond by referring it as “Synthetic Diamond,” is that of a “fake” and “cheap” diamond. According to a survey published in a joint report by Antwerp World Diamond Centre (AWDC) and Bain & Company in December 2012,<sup>4</sup> when people were asked “What words come to mind when you think about synthetic diamonds?” the most frequent answers were “cheap” and “fake”. The following graphic from the Bain & Co. report shows the terms most frequently associated with synthetic diamonds, with text size indicating the most frequently provided responses.

*Figure 3.5:* A chilly reception for synthetics in every market



The survey results also indicate that consumers associate “synthetic” and “fake” diamonds with diamond simulants such as Cubic Zirconia, Moissanite, White Sapphire and YAG, which are chemically, physically, and optically different from mined (or lab-grown) diamonds. The chart below illustrates the similarities between lab-grown and mined diamonds and how they differ from simulants that are properly considered “synthetic” or “fake”.

<sup>4</sup> Bain and Company, Global diamond industry portrait of growth, Page 18-19  
[http://www.bain.com/Images/BAIN\\_REPORT\\_Global\\_diamond\\_industry\\_portrait\\_of\\_growth\\_.PDF](http://www.bain.com/Images/BAIN_REPORT_Global_diamond_industry_portrait_of_growth_.PDF)



	<b>What is it?</b>	<b>Hardness</b>	<b>Specific Gravity</b>	<b>Refractive Index</b>	<b>Dispersion</b>
<b>Lab-grown Diamond</b>	Carbon, C	10.00	3.52	2.42	0.044
<b>Earth-mined Diamond</b>	Carbon, C	10.00	3.52	2.42	0.044
<b>Moissanite</b>	Silicon Carbide, SiC	9.25	3.21	2.65	0.104
<b>Cubic Zirconia</b>	Zirconium Oxide, ZrO <sub>2</sub>	8.50	5.65	2.15	0.060
<b>White Sapphire</b>	Aluminum Oxide, Al <sub>2</sub> O <sub>3</sub>	9.00	3.97	1.77	0.018
<b>YAG</b>	Yttrium Aluminum Garnet, Y <sub>3</sub> Al <sub>5</sub> O <sub>12</sub>	8.25	4.60	1.83	0.028

Much of the confusion in recent years stems from the marketing of moissanite and cubic zirconia, which are frequently advertised as “synthetic diamonds”. As a result, shoppers confuse the cubic zirconia “synthetic diamond” with the lab-created diamond that actually has the same properties as a mined diamond. As evidence of the potential for the use of “synthetic diamond” to foster consumer confusion, we note that there are currently hundreds of “synthetic diamond” products offered for sale on ebay.com and amazon.com, the vast majority of which are moissanite or cubic zirconia.<sup>5</sup>

The FTC has acknowledged that the term “synthetic” is confusing to consumers. When considering appropriate qualifiers as part of the 1996 regulatory flexibility review, one commenter argued that most consumers “understand synthetic to mean fake, artificial, and otherwise of low quality. The commenter also stated that it is “essential that it ‘be able to honestly and accurately educate consumers that the only difference between its gemstones and natural is the environment in which the crystals grow.’”<sup>6</sup> In response, the Commission noted that it “is persuaded that the term ‘synthetic,’ as applied to gemstones, is misunderstood by some consumers to mean something fake or artificial.”<sup>7</sup> Given that

<sup>5</sup> Based on a search for “synthetic diamond” on [www.ebay.com](http://www.ebay.com) and [www.amazon.com](http://www.amazon.com) conducted on June 3, 2013.

<sup>6</sup> 61 Fed. Reg. 27209 (May 30, 1996) (quoting Comment 231, pp.2, 5, 22).

<sup>7</sup> 61 Fed. Reg. 27209 (May 30, 1996).



lab-grown diamonds have the same properties as mined diamonds, the survey evidence of consumer confusion regarding lab-grown diamonds, and the widespread and inconsistent use of the term “synthetic” that can contribute to this confusion, we urge the Commission to remove the term “synthetic” from the list of appropriate qualifiers for lab-grown diamonds as designated in Section 23.23(b) of the Jewelry Guides or add an additional sentence to that section that states that the term “synthetic” shall not be used to describe lab-grown diamonds.

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The lab-grown diamond industry has undergone significant advancements in recent years. These advancements warrant the aforementioned requested distinctions in the Jewelry Guides to help industry and consumers better understand lab-grown diamonds and the benefits that they provide.

Gemesis appreciates the opportunity to provide these comments and looks forward to being part of the discussion going forward.

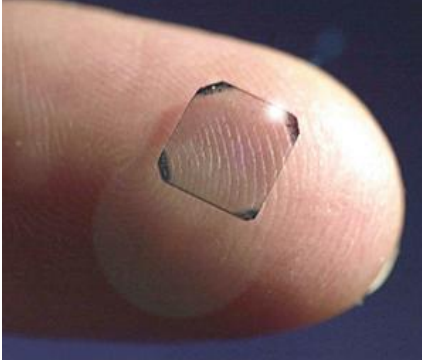
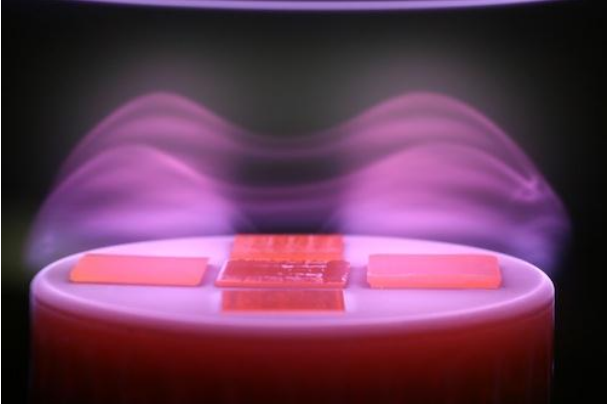
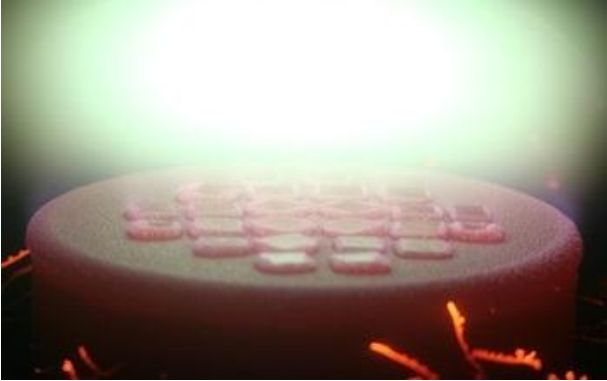
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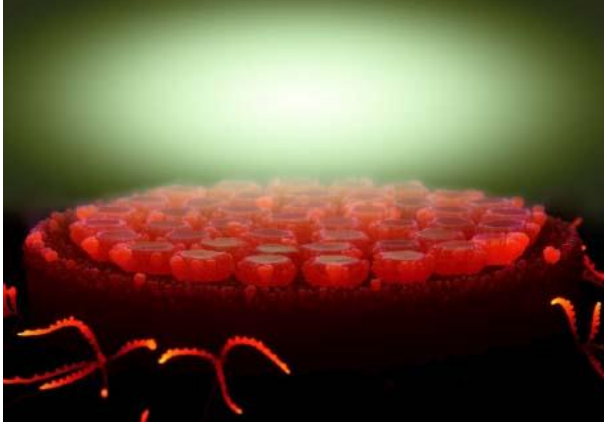
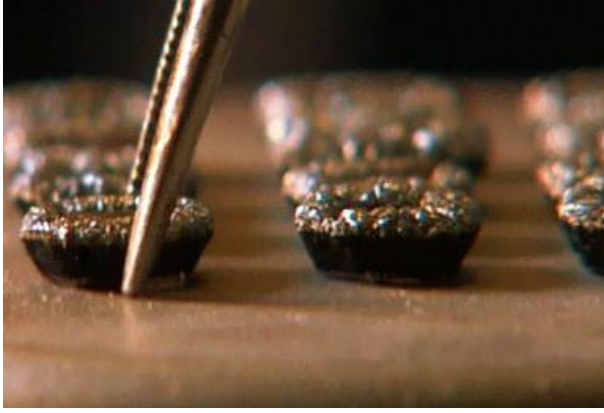



Suraj Mehta  
President

## Exhibit A

### CVD PROCESS FLOW FOR GROWING DIAMONDS

<p><b>1. Diamond Substrate</b></p> <p>Diamond wafer seeds are placed in the growth chamber. A diamond grows only over a diamond and care must be maintained keep the diamond seeds and growth chambers ultra clean and impurity free</p>	
<p><b>2. Preparation of Growth Chamber</b></p> <p>Gases which can be sources of carbon atom are injected in the growth chamber. Growth environment conducive for re-crystallization of carbon atoms into diamond is established by managing temperature and pressure.</p>	
<p><b>3. Liberated carbon atom deposits on the seed</b></p> <p>The natural growth process begins when the diamond seed is subjected to the appropriate growth environment. The carbon atoms get liberated from the carbon source and start depositing on the diamond seed, thereby forming a cubic structure with tetrahedral bonds.</p>	

<p><b>4. Re-crystallization Leads to Growth</b></p> <p>Diamond starts growing as a result of crystallization of carbon. This process happens at an atomic level and the growth of the diamond once the process begins is purely natural. Wafer seeds slowly become diamond crystals</p>	 A glowing red diamond wafer seed is shown on a dark surface. The wafer is circular and composed of many small, interconnected diamond crystals. It emits a bright red glow, and the background is dark with a soft green light source above it.
<p><b>5. Grown Rough Diamonds</b></p> <p>The Diamond Wafer Seeds slowly grow into rough diamonds, each diamond having a unique shape and size since the growth process cannot be controlled or manipulated. They are then sent for grading to laboratories like mined diamonds.</p>	 A rough diamond is being held by tweezers. The diamond is dark and irregular in shape, with a rough, crystalline surface. The tweezers are metallic and positioned to hold the diamond. The background is dark and out of focus.
<p><b>6. Cutting and Polishing</b></p> <p>Once the rough diamond is obtained, they are then prepared for required applications: jewellery, industrial, scientific or technology applications. The cutting and polishing procedure is same as that for a mined diamond since both are identical in their properties.</p>	 Several cut and polished diamonds are shown. The diamonds are clear and faceted, with various shapes including round brilliant cuts and rectangular cuts. They are arranged on a light-colored surface, and their facets reflect light, creating a sparkling effect.

Source: Ila Technologies, Scio Diamonds, NOVA scienceNOW