HRD Antwerp – Research Newsletter

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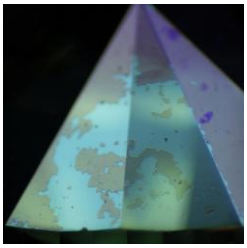

Scientific Events (read more)

Scientific Diamond News

CVD synthetic diamond developments

Several recent reports in the media and publications in various scientific journals highlight the development of CVD synthetic diamond. Significant advances have been made in the growth and treatment of single crystal CVD synthetics. Nowadays the maximum growth rates are of the order of 10 to 15 µm/hour for near-colourless, almost nitrogen–free, single crystal CVD diamond. For brownish to brownish yellow, nitrogen-doped single crystal CVD diamond films, growth rates can be up to ten times higher. More information can be found in [1-3]

It is well-known that brownish CVD material can be made colourless by High Pressure – High Temperature (HPHT) treatment [4]. A survey giving more details on HPHT equipment used in these treatments can be found in [5]. A recent development is Low Pressure High Temperature (LPHT) treatment. Here, brownish CVD material is made colourless by heating it to 2000°C and more, at pressures below 1 atm, in hydrogen gas. This may be done immediately after growth in the CVD chamber. Information on this technique can be found in [6, 7].

It should be noted that CVD synthetics are only coming on the market at present in very limited numbers. However, this might change in the future, and the diamond sector should be prepared for their identification.

References

[1] De Gryse O. and De Corte K, *HRD Research investigates 'Made in Europe' synthetic CVD diamonds*, Antwerp Facets No2 – Edition 22, pp. 14-15, 2005.

[2] Teraji T., *Chemical vapour deposition of homo-epitaxial diamond films*, Phys. Stat. Sol. (a) 203, No. 13, pp. 3324–3357, 2006.

[3] Brinza O., Achard J., Silva F., Bonnin X., Barroy P., De Corte K., and Gicquel A., *Dependence of CVD diamond growth rate on substrate orientation as a function of process parameters in the microwave power density regime*, Phys. Stat. Sol. (a) 205, No.9, pp. 2114-2120, 2008.

[4] Wang W., Moses T., Linares R.C., Shigley J.E., Hall M., and Butler J.E., *Gem-quality synthetic diamonds grown by a chemical vapor deposition (CVD) method,* Gems & Gemology, Vol. 39, No.4, pp. 268-283, 2003.

[5] Blanchaert M. and Van Royen J., *Making and changing diamonds at the touch of a button,* Antwerp Facets No4 - Edition 1, pp. 16-17, 2008.

[6] Meng Y., Yan C.S., Lai J., Krasnicki S. , Shu H., Yu T., Liang Q., Mao H.K., and Hemley R.J., *High-temperature/low-pressure (LPHT) annealing of SC-CVD diamond*, 2nd International Conference on New Diamond and Nano Carbons (NDNC2008), 2008.

[7] Meng Y., Yan C.S., Lai J., Krasnicki S. , Shu H., Yu T., Liang Q., Mao H.K., and Hemley R.J., *Enhanced optical properties of chemical vapour deposited single crystal diamond by low pressure/high-temperature annealing*, Proceedings of the National Academy of Sciences, 17620-17625, November 18, 2008.

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Treated pink diamonds return to the front page

Pink diamonds are back in the spotlights. A number of reports on treated pink diamond have emerged recently. An important treatment method is a three-step process in which natural type Ia diamonds are HPHT treated, followed by irradiation and subsequent heating. In this way pink diamonds are produced with a colour that resembles very much natural pink.
The February 2009 issue of the "Rapaport" magazine features an article on the colour origin of natural and treated pink diamonds [1].
Similar treated stones have been brought on the market earlier as "Imperial Red Diamond" [2].

References

[1] Erel E., *Pink Diamond Treatment,* Rapaport Diamond Report, Vol. 32, No2, pp. 126-127, 2009.

[2] Genis R., *Imperial Red Diamonds,* Rapaport Diamond Report, Vol. 28, No30, pp. 1-177, 2005.

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Fancy colour coatings on the market

For several centuries, coatings have been used to change the apparent colour of diamonds and other gemstones. Recently, however, stones have appeared on the market with sophisticated coatings, applying new coating technology developed from the optical and electronics industry in the early 1990s. Coatings are seen based on calcium fluoride (CaF_2) and on silicon dioxide (SiO_2).
Although high-tech procedures have been followed to produce the coatings, they can still be easily observed using a loupe or a microscope, and they can be damaged or removed by scratching or by boiling in acids.
More information can be found in [1, 2].

References

[1] Shen A.H., Wang W., Hall M.S., Novak S., McClure S.F., Shigley J.E., and Moses T.M., *Serenity coated colored diamonds: detection and durability,* Gems & Gemology, Vol. 43, No.1, pp. 16-34, 2003.

[2] De Corte K., *Dressed in Pink,* ADL International Magazine, pp. 44-45, January 2008.

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Scientific Events

Scientific conferences related to diamond and precious stones:

3rd International Conference on New Diamond and Nano Carbon (NDNC-2009), Transverse City, Michigan, USA, June 7-11, 2009.
Details: http://www.mrs.org/ndnc2009/

Carbon '09, Biarritz, France, 14-19 June 2009. Details: http://www.carbon2009.org

ICMAT 2009 - International Conference on Materials for Advanced Technologies, 28th June - 3rd July 2009, Suntec Centre, Singapore.
Details: http://www.mrs.org.sg

The Gemological Research Conference (GIA), 21-23rd August 2009, San Diego, California, **has been postponed**.
Details: http://www.grc2009.gia.edu.

World Diamond Conference, Perth, Australia, 31th August – 1st September 2009, Details: http://www.worlddiamondconference.com/

Diamond 2009 - 20th European Conference on Diamond, Diamond-like Materials, Carbon Nanotubes, Nitrides and Silicon Carbide, September 7-11 2009, Athens, Greece. Details: http://www.diamond-conference.elsevier.com.

CVD-XVII and EUROCVD-17, 4-9th October 2009, Vienna, Austria.
Details: http://www.eurocvd17.org

MRS Fall Meeting, Symposium J, Diamond Electronics and Bioelectronics: Fundamentals to Applications III, November 7-11 2009, Boston, USA. Includes other symposia on nanotubes, graphene, etc. Details: http://www.mrs.org/s_mrs/sec.asp?CID=9546&DID=198609.

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