Additive Free HologramCap for Primary Packaging

KISICO, the German based producer of packaging caps and closures, has used Morphotonix brand protection technology to develop a highly-secure hologram-topped cap free from additives or inks – called the HologramCap – for the packaging sector.

Morphotonix is a Swiss based start-up company that integrates custom holographic-like diffractive elements on 3D metallic master moulds for plastic injection moulding, compression-moulding, blow-moulding, and thermo-forming.

The hologram design is integrated into the injection moulding production process for the cap, without the need for any additives, labels, inks, or post-processing. Without changes to existing production processes, it can be customised according to customer requirements.

The patented Morphotonix process to nano-engrave moulds or inserts integrates nano-structures that can incorporate both overt and covert security features into flat and/or curved surfaces.

The nano-structures have a lifetime compatible with that of the moulds and are replicated directly into the rigid cap during the production process. Holography News® readers may remember we reported on the establishment of Morphotonix, which is co-founded by Dr Veronica Savu, CEO and Dr Vaida Auzelyte, CTO in 2014, (see HN June 2014) and on their production of diffractive structures in chocolate. Since then, the company has gone on to win numerous awards, including receiving an award in last year's International Hologram Manufacturers Association (IHMA) awards in the innovation in holographic technology category.

More recently the company was also selected as one of the top 50 Swiss start-ups by Bilan, the reference magazine reporting on the Swiss economy.

Continued on page 7>

OpSec to Buy API Security Foils

As Holography News™ went to press Opsec Security announced that it had entered into discussions with API Group for the purchase of its security business API Holographics based in Salford, UK.

Richard Cremona, CEO of OpSec Security said, ‘API’s security holography division will provide OpSec greater capabilities in the manufacturing of foils and laminates. Quality security products, responsive customer service and market synergies make this potential acquisition beneficial to both OpSec Security and API customers.’

Consultation with API Holographic’s employees, customers and partners is already underway and API Group expect to complete the process early in April 2016.

API Group is strategically focused on the packaging arena whereas the holographic security product line addresses a different market segment.

Dino Kiriakopoulos, President and CEO of the API Group said ‘This transaction will support API Group’s strategy for delivering world class brand enhancement solutions to brand owners and the packaging market, our core business segment.

‘It will allow us to focus investment and improvement activities across our core brand enhancement business and ensures that the holographic security foils business is maximized as part of a company with specific focus in those markets.’

www.opsesecurity.com
www.apigroup.com
The Story of OptoClones

At The Holography Conference in Shanghai last December, The Hellenic Institute of Holography (HiH) won the Best of Year Excellence in Holography Award for the Bowater Collection of Fabergé OptoClones™.

Here we outline some of the history and the technology used to produce these magnificent and captivating full-colour display holograms using the HiH’s portable ZZZyclops™ laser camera, special holographic plates produced by Colour Holographic and Ultimate Holography, and the HiH HoLoFoS™ LED spotlight.

History

In the early days of holography, display holograms were introduced to museums as a new display technique to exhibit rare and expensive artefacts. Although these early Denisyuk single beam monochrome holograms – recorded using red wavelength lasers on ultra-fine grain silver halide emulsions – looked very realistic, they were not able to reproduce the artefact’s colour, which was seen as a huge disadvantage for most museum applications. In addition, museums hesitated because of the expense and the need for special recording laboratories.

It was not until the late 1980s, in the Soviet Union, that the goal of recording Denisyuk holograms which displayed the colours of the object as accurately as possible began to emerge – made possible by the arrival of suitable lasers and also panchromatic recording materials (i.e. materials sensitive to light of all colours in the visible spectrum). An early example of a colour hologram is the icon Spas recorded by Usanov and Shevtsov at the Holography Lab, State Optical S I Vavilov Institute.

The principle of recording Denisyuk colour holograms involves the use of three different coloured lasers – red, green and blue (RGB) – but it is possible to add one or two more lasers using additional beam combiners. However despite these technical advances, the holographic laboratory set-up to produce the colour holograms at the time was static – utilising large, often water-cooled argon-ion and krypton-ion lasers – and so was not ideally suitable for recording valuable museum artefacts, particularly as museums are reluctant to either bring artefacts for the recording or send these for fear of breakage or the artefact being stolen.

In addition to the Z3RGB camera, low light scattering panchromatic recording materials are also necessary. Ultra-fine grain silver halide emulsions or photopolymer recording materials can be used, but for the recording of OptoClones silver halide emulsions are used. So now that we have both the recording materials and portable holographic recording camera, the third factor to display Denisyuk colour holograms or optical clones (and which is sometimes overlooked) is the light source used to display the hologram and hence show the ultra-realistic image (see later).

Recent progress in light emitting diodes (LEDs) has opened up new possibilities for the display of colour holograms or optical clones. A significant advantage of LEDs is that they possess a much smaller bandwidth than broadband white-light sources. Although typical bandwidths are much larger than those commonly associated with lasers and laser diodes, LED light sources should ideally be matched to the recording laser wavelengths (or vice versa). This guarantees that only the white light from the LED source (which is a mixture of the primary LED wavelengths) contributes to creating the holographic image.

If a halogen spotlight is used to display colour holograms, then a large part of the light spectrum emitted illuminates the holographic plate without having any impact on the intensity of the image; instead the light is scattered which lowers the image contrast. This lack of scattered light when using LED illumination leads to significantly higher image quality.
In addition, LED light sources have considerable advantages over halogen and other traditional lighting sources, such as long life, small size, high durability and robustness to thermal and vibration shocks, low energy usage/high energy efficiency, no IR or UV beam output, directional light output, and digital dynamic colour control – white point tuneable.

Using the latest advances in LED technology, the HIH developed a special spotlight called HoLoFoS™ that is capable of achieving high quality display reproduction of optical clones.

The HoLoFoS LED spotlight.

The HoLoFoS spotlight contains RGB LEDs, mixing optics, lenses and heat sinks together with a microcontroller to control the intensity of each LED. The spotlight can be fitted with a variety of LEDs at selected wavelengths and more than three different LEDs can be fitted to match the various recording wavelengths. For example, a RRGBB LED configuration can be achieved if a hologram has been recorded with four or five laser wavelengths to obtain improved colour matching.

However the key feature is that the HoLoFs LEDs have the same spectral characteristics for the red, green and blue LEDs to the lasers of the Z3RGB camera used to record the OptoClone.

**Museum Applications of OptoClones**

An early holographic project undertaken by Prof Hans Bjelkhagen at the Centre for Modern Optics (CMO), UK was the ‘Bringing the Artefacts Back to the People’ museum project.

This involved collaboration with a number of museums to produce optical clones of various artefacts that were used as a travelling exhibition of ‘virtual artefacts’ installed for a limited time at different museums. An example from this project is the optical clone of a Tudor owl and Sergeant Arms Ring.

Other museum projects, prior to the Fabergé museum collection of OptoClones undertaken by HIH, include the exhibition ‘Heaven and Earth: Art of Byzantium from Greek Collections’ that featured 170 rare and important works, drawn exclusively from Greek collections that were shown in the United States.

For this exhibition several OptoClones were recorded by HIH using the Z3RGB camera mobile equipment previously shown. These OptoClones were chosen by the Athens Byzantine and Christian Museum for public display in their halls in place of items on loan for almost one year. The choice of ultra-realistic holograms without any explanatory conventional signage or digital media but with a clear written message that the real objects were not present!

**What is an OptoClone?**

OptoClone is the worldwide trademarked name introduced by HIH for a Denisnyuk colour hologram recorded with a minimum of three RGB lasers and displayed using RGB-LED lights in a special display case.

Since the words ‘hologram’ and ‘holography’ are used for non-holographic applications today (for example in 2D Pepper’s ghost projection techniques), it is important to introduce new terms which describe real holograms and ultra-realistic imaging.

An ultra-realistic image is defined by the following:

- It looks ‘identical’ to the real object observed by eye;
- Very accurate colour rendition;
- Same scale – no magnification;
- Resolution corresponds to human eye resolution;
- No detectable image blur;
- No field of view limitations;
- Image light reflections move like they do on the object;
- In principle – recording light waves reflected off an object, that are stored and can be recreated later;
- Only Denisnyuk holography can accomplish this.
The Bowater Fabergé Museum Collection of OptoClones — The ‘F’ Adventure

On 25 September 2014, a partnership agreement between the Fabergé Museum, St Petersburg, the HIH and ITMO University of St Petersburg was signed to embark on one of the most ambitious projects yet undertaken by HIH — to produce OptoClones of the Fabergé Imperial Easter eggs and bring them and the holographic imaging technique to a wider audience.

The Fabergé Imperial Easter Eggs

The jewelled and enamel painted eggs were made by Carl Fabergé (1846–1920) in his workshop in St Petersburg. 50 Imperial Easter Eggs were made between 1885 and 1916 that often took a whole year to make.

The first egg was the Hen Egg, which was a gift to Empress Maria Fyodorovna from the Emperor Alexander III. One of the most famous eggs is the Coronation Easter Egg, which was given to Empress Alexandra Fyodorovna in 1897 by the Emperor Nicholas II as a memory of the coronation in 1896. As with all Imperial Eggs, this egg has a surprise inside: an exact tiny replica model in gold of the original carriage.

Nine of the Easter eggs at the museum were acquired from the Malcolm Forbes Collection in the US by Viktor Vekselberg in 2004. He brought them back to Russia for an alleged investment of $120 million and put them on display in St. Petersburg in November 2013 when the new Fabergé Museum opened.

The museum contains not only the eggs but a total of more than 4,000 other beautiful artefacts from the Fabergé workshop too.

Making the Fabergé egg OptoClones

The mobile equipment including the Z3RGB camera were sent from the HIH, Greece to the Fabergé museum in the spring of 2015. The recording of the Fabergé egg OptoClones took place in the basement laboratory of the museum, under tight security behind bars, where the mobile recording tent was installed.

The Z3RGB camera was positioned outside the tent, sending ‘white’ laser light into it. Inside the tent was a tripod with a front-silvered mirror to reflect the laser light down to a platform into a recording box where the eggs were positioned, behind the silver halide recording plates supplied by UK based Colour Holographics on an exclusive non-commercial licence to HIH, with commercially available Ultimate Holography (Yves Gentet) plates from France as a backup solution.

The 1911 Bay Tree Fabergé Easter Egg is shown positioned in the recording box, with the Faberge museum curator Alexey Pomigalov (left) and Andreas Sarakinos head holographer and scientific director of HIH.

The excellent colour reproduction and extensive field of view of an OptoClone adds to the illusion of observing a real object rather than portraying a mere image. The use of OptoClones in museums and the tourist industry alike could exploit this new 3D imaging technique to enable increasing numbers of people to experience the visual reproduction of an artefact or object and its history and place within different cultures.

Other applications include the recording of oil paintings. Although typically 2D, the ultra-realistic OptoClone image will provide details on the structure and texture of the painting, such as brush strokes, with near perfect colour reproduction.

The Bowater collection of Fabergé OptoClones was made possible only with the support of ITMO University and Fabergé museum of St Petersburg, and the personal sponsorship of James Bowater, founder of Bowater Holographics.

BB-PAN plates were used primarily for the recording of the OptoClones under exclusive licence to HIH by Colour Holographics (UK) in addition to a limited number of ULTIMATE04 plates from Ultimate Holography (Yves Gentet) in France.
From the Archives

10 years ago...

ABNH Sounds Warning on HoloMag

*Holography News*® reported that further to the adoption of HoloMag™ (holographic magnetic tape) by MasterCard, Visa and American Express, American Bank Note Holographics had filed a statement with the US Securities and Exchange Commission sounding a warning about the technology. It stated that there had been a small number of incidents involving certain card terminals that have been affected by electro-static discharge from the static electricity carried on cards incorporating HoloMag.

According to the statement, ABNH believed that the disruptions occurred only in certain terminals and in certain conditions, such as low humidity, and that the rate of occurrence was insignificant compared with the number of transactions processed without disruption.

However, the company warned that, whilst it continued to sell HoloMag in significant quantities, the problem could lead to delays in implementation by some customers, and that it had been advised to develop a second generation of holographic magnetic data tape products that addressed this matter.

The company had already commenced this development, but further warned that competitors were developing products to compete with its current and second generation offerings and this factor, together with delays in implementation, would impact future sales and profitability.

ABNH announced a 41% increase in sales for the first nine months of 2005 to $22.2 million, while net income grew by 65% to $2.18 million. According to ABNH president and CEO Ken Traub, part of this success was due to the adoption and roll-out of HoloMag.

20 years ago...

The DuPont Family Tree Evolves

20 years ago, *Holography News*® reported the acquisition of the assets of US Holographics (USH) by Celadon Corp for $750,000, which was to market the company’s dichromated and photopolymer holograms under the Krystal Holographics International name.

USH had recently gone bankrupt, but Krystal was one of its main customers and its parent decided there was more mileage in the product and planned to invest at least as much again in marketing and R&D. Krystal operated the production plant in Utah and used its worldwide marketing organisation successfully until its holography business was in turn acquired by DuPont.

 Today DuPont supplies anti-counterfeit holographic Izon® technology tamper evident labels that incorporate a variety of overt and covert features and can also be used for product tracking.

Good News for Authentication Holography

There was good news for security hologram producers in the *HN* March 1996 issue. MasterCard gave a vote of confidence to holograms through the announcement that it would include a new 3D hologram (replacing its 2D/3D design) on redesigned card. ABNH signed a five-year deal as MasterCard’s exclusive supplier for this new hologram.

Today MasterCard continues to use holograms on credit and debit cards.