An overview of Optical Document Security II, San Francisco, 20-22 January 2010

Optical Document Security, the conference on Optical Security and Counterfeit Deterrence, has emerged as a stronger fixture in the security calendar judging from the recent success in San Francisco.

Until 2008, ODS was a part of the SPIE conference held in San Jose, California and its organizer, Ruud van Renesse, felt the subject deserved to be treated in a more focused way. In 2008, under the auspices of Reconnaissance International, the conference was held as a stand alone topic and transferred to San Francisco. Considering the recessionary times and tight budgets, it was remarkable to note that attendance at the 2010 event held 20-22 January exceeded the previous event by more than 30 delegates swelling the numbers to almost 250.

Eighteen national, state and reserve banks sent delegates, demonstrating the heightened level of interest in a quality event dealing with the technology of serious security print features suitable for currency applications. Security printers, university researchers and component suppliers presented their latest advances which were usually as appropriate for IDs and travel documents as for currency applications.

The conference opened on 20 January, 2010 with a short course on Optically Variable Devices. The 4-hour course was given by Ruud van Renesse of VanRenesse Consulting, based in the Netherlands, and author of the book 'Optical Document Security', now in its third edition.

The first day of the conference itself was mostly devoted to currency issues. The first session chaired, by Sara Church of the Federal Reserve Board (USA), featured talks on aspects of currency printing from the National Bank of the Netherlands, KBA-Giori, Ostwestfalen-Lippe University of Applied Sciences and Austrian Banknote Printing Works. Hans de Heij of the National Bank of the Netherlands made the sobering observation that there are not more than 50 public security features available for banknotes. Although watermarks still have the highest public recognition, it is a major challenge for banks to decide which of the others should be used.

In the second session of the day, chaired by Malcolm Knight of De La Rue, Erik Balodis of the Bank of Canada presented an innovative study carried out in conjunction with the psychology department at the University of Waterloo. The study looked at the effectiveness of a variety of security features vis-à-vis the general public, cashiers, bank tellers and law enforcement. Factors such as the training time required to produce effective recognition, the number of false negatives recorded and the retention time of training, were all recorded in a so-called 'Usability Quadrant'. This analysis, it is hoped, will make feature selection more objective in the future.

The last paper in this session consisted of the long awaited announcement by OVD Kinegram Corp of the work being carried out on 'A Photopolymer-based OVD for Banknote Application'. Wayne Tompkin explained that in 2006, OVD Kinegram entered into a contract with 'a central bank' (known to be the Swiss National Bank) to develop an alternative to a metallized, embossed holographic security feature.
One of the major breakthroughs for the photopolymer-based volume hologram for securing documents is the Identigram® on the German passport and ID card, produced by the Bundesdruckerei; the Identigram® includes a three-dimensional image, personalized holographic photograph, and MRZ data, as well as a KINEGRAM® as a volume hologram.
OVD Kinegram and KURZ, with its partners, have developed a new security system called *KINEGRAM voLume*®. The samples show a photopolymer laminate applied to banknote paper with 2D graphics based on Kinegram imagery.
The flat imagery contrasted with the samples shown by Dai Nippon Printing on their table top exhibition. Their sample displayed a thin, transferred photopolymeric film with deep, 3D imagery more typical of a volume medium. Furthermore, DNP showed a sample embedded into paper as a window thread. (This will be formally announced in February 2010).

Figure 10 of the paper presented by Wayne Tompkin of OVD Kinegram Corp. (Switzerland)
Photograph of a sample banknote with a two-colour version of KINEGRAM voLume®, applied as a laminate stripe.

The afternoon sessions were devoted to substrates and printing. Stephen Simske and Jason Aronoff of Hewlett Packard Labs spoke about different aspects of the coloured or grey scale 2D barcodes developed for track and trace and product provenance, authentication and forensics. Their papers addressed many of the variables which must be considered when optimizing printed marks for their use in mobile applications.

Luke Maguire of the Reserve Bank of Australia described the work he has carried out to emboss non-diffractive optically variable devices on the clear polymeric substrate used for currency. These remarkable structures, termed *non-diffractive switching images* (NSI), appear differently in reflected and transmitted light and, as seen in the example below, also show rotational variations. The microfeatures are achieved by creating prismatic elements which cause total internal reflection.

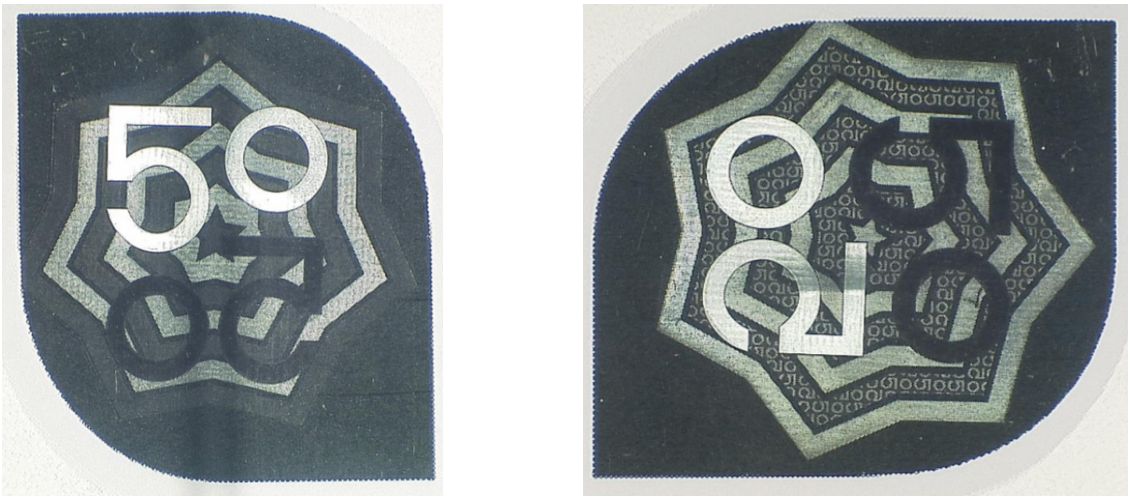


Figure 4 of the paper presented by Luke Maguire of the Reserve Bank of Australia.
The NSI viewed in reflection. The samples are illuminated from above using two lights, on either side of the viewer's position and aligned to the horizontal axis of the image. The sample has been rotated by 90º between the two images.

The Thursday program was completed by three papers devoted to inks with special properties. Tsuyoshi Uematsu of the National Printing Bureau of Japan presented a thought provoking account of a novel class of pigments designated as Elasticoluminescent. The author presented work done with some triboluminescent compounds which displayed two fluorescent and one phosphorescent emissions when subject to mechanical stimulation. He also appealed for more examples so that they could be evaluated as novel print features. They decided to use not only ultraviolet and other electromagnetic waves that are commonly employed as energy sources to excite a luminescent material, but also mechanical energy such as from friction and shear.

The evening program consisted of a buffet dinner accompanied by a table top exhibit with poster papers.

The Friday morning program consisted entirely of presentations on optically variable security features. This began with the announcement by 3M of their new, multicoloured, three dimensional floating image security feature. As a worthy successor

to Confirm™, this novel feature is available as a security laminate combining overt and covert security elements. Most notable are the coloured (red and blue) graphic elements which appear either above or below the image plane. Although using lenticular technology rather than glass beads, the covert aspect of a bright image seen using the standard retro-viewer, is retained.

From figure 12 of the paper presented by Douglas Dunn of 3M Safety, Security, & Protection Services Laboratory (USA). Transparent floating image film containing red floating and green sinking sine waves.

There followed three more papers on aspects of microlenticular moiré technology. These were discussed in turn by Crane Micro-Optics Solutions and their emerging competitors in this field, namely OVD Kinegram Corp and Papierfabrik Louisenthal GMBH. It became clear from the quantity of ingenious research work being carried out in this area that micro-optics are attracting much R&D activity and some significant customer (central bank) interest.

In the second session of the morning, Andre Arsenault of Opalux Inc. presented some novel aspects of the Opalux material which mimics the optical appearance of natural opal stones. In contrast to the gemstones which derive their fire from structured arrays of silica and water molecules, Opalux achieves a similar effect from voids in a polymeric layer. The use of polymers with different thermal and mechanical properties gives rise to a wide variety of effects suggesting a multitude of different applications.
In a second paper from 3M Security Systems, Bruce Wilson used the occasion to announce the pioneering work recently carried out on creating optically variable polymeric fibres. While looking superficially like fishing line, these complex fibres consist of a core surrounded by polymer layers with alternating refractive indices. One application cited for such fibres is the stitching of passports where the thread colour varies subtly from magenta to cyan depending on the angle of view and the background.

The final sessions, as always remarkably well attended in spite of it being Friday afternoon, were devoted to digital recording and machine reading and also the wider considerations of identification and authentication.
Nigel Abraham of OpSec Security Group gave a lively presentation of Coherent Diffractive Imaging (cdi) carried out using a highly modified laser beam CD recorder functioning in a spiral on a turntable. By tightening the beam recording specifications and using imaginative graphics often based on lenses, a wide variety of imaginative visual effects could be produced.

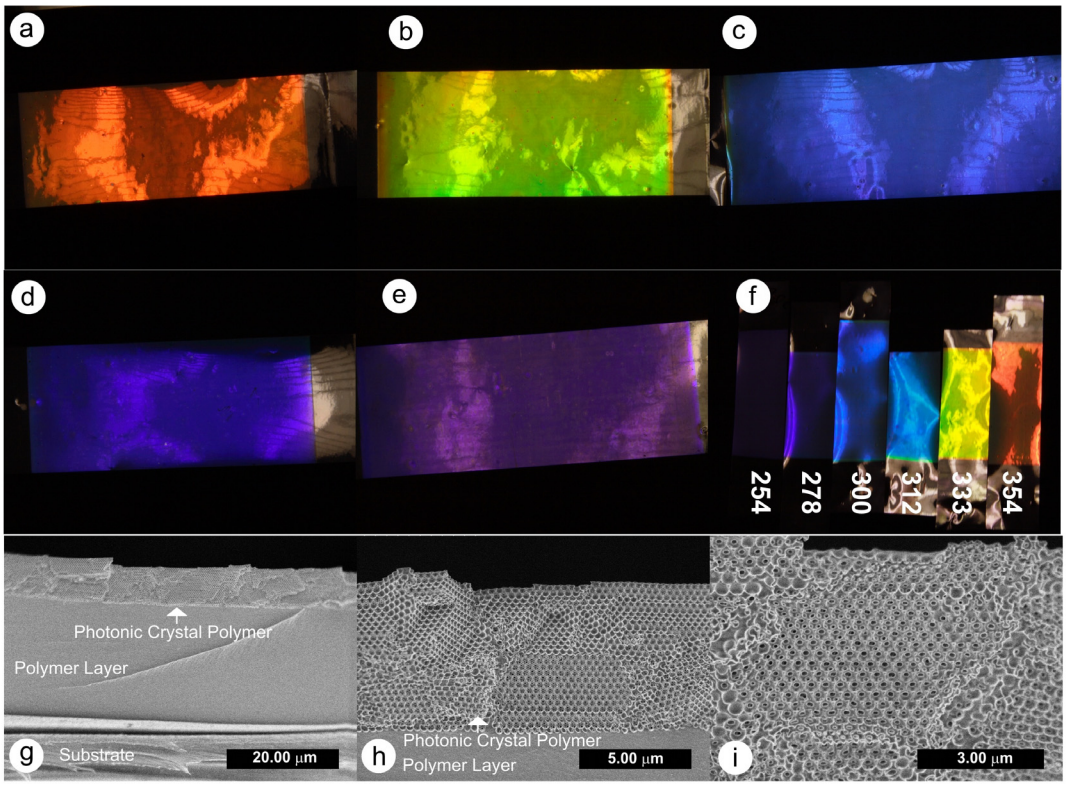


Figure 1 of the paper by André Arsenault of Opalux Corp. (Canada)
A selection of inverse opal films on polyester having different colors: a) red, b) yellow-green, c) cyan, d) blue, and e) violet. Part f) shows a variety of films side-by-side, along with the diameter of the spheres used in their production (in nm). Parts g) to i) show SEM images taken at 5 kV at progressively higher resolution.

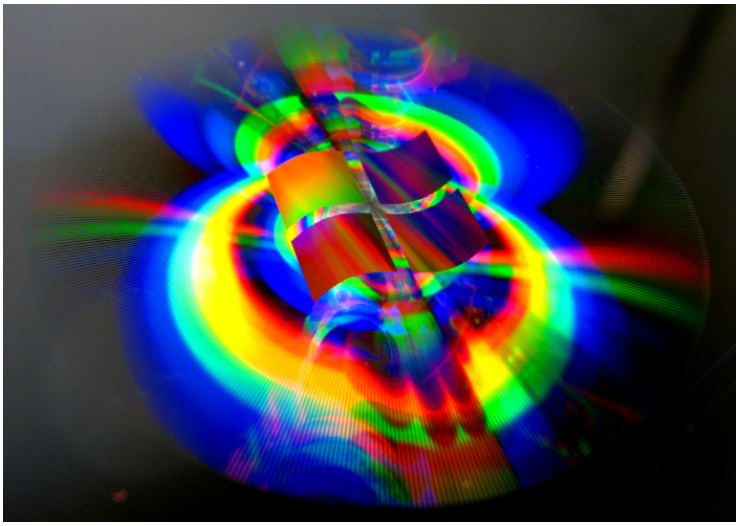
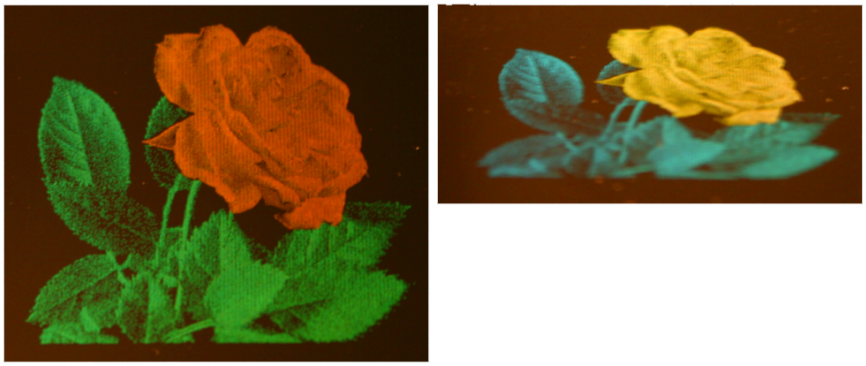


Figure 4 of the paper by Nigel Abraham from OpSec (USA).
Picture of "floating" Windows Flag

Robert Vrancken of Validus Technologies, a new player in the security field, spoke of the plastic based labels they are originating for brand protection using optically active liquid crystals, applied using inkjet technology. Serialization using alphanumerics or barcodes can be generated this way thus providing track and trace in addition to anticounterfeit printing, while optically variable information and portraits for ID documents appear also within the scope of this technology.



From figure 6 of the paper by Robert Vrancken from Validus Technologies (The Netherlands).
Multi-colour ink jet printed image of a rose under two angles of observation.

For Sagem Identification, Jan van den Berg described their *3D Photo ID* system for laser engraving 3D portraits into polycarbonate ID substrates. The 3D effect is achieved by taking 4 photographs of the subject under different angles and creating a stereogram in a lenticular lens array. The need for a dedicated image capture device makes this technology particularly suited to centralized government applications. However, as digital camera technology is notparticular expensive, decentralized applications appear not at all improbable.

Finally, Garth Zambory of JDSU Authentications Solutions Group described their award winning Holofuse; a polycarbonate compatible laminate combining a laser engravable layer with a holographic layer fused above it in such a way that no image substitution (a popular way of tampering with travel documents) could take place.