NANOTECH

CASE STUDY

LumaChrome™

Enhanced Banknote Security with LumaChrome™ Colour-Shifting Film

505 – 3292 Production Way Burnaby, BC Canada V5A 4R4
+1.604.678.5775 | info@nanosecurity.ca | www.nanosecurity.ca

Trading on the TSX as **NTS** and
listed on the OTCQX as **NTSFF**

Nanotech's LumaChrome™ colour-shifting film's impactful colours, simplicity to use, and durability have made it the standard in banknote and document for over two decades.

BACKGROUND

Banknotes are an indispensable part of every stable financial and economic system, and they need to be undeniably authentic, cost-effectively distributed and readily available. The history of forged banknotes is almost as extensive as the history of money itself. The first electrum coins in Lydia were regularly faked, and coming across counterfeit coins in Ancient Rome was a daily occurrence. Even in modern times, the forgery of banknotes is an inherent challenge faced by Central Banks when currency is issued. Fighting this has been a principal driver of developing high security printing methods and security features. Central Banks and National Engraving Bureaus began to arm banknotes with new, more sophisticated systems such as holograms, multi-colored bills, embedded devices, raised printing, microprinting, watermarks and most importantly color shifting foils – which was difficult to replicate.

CHALLENGES

Counterfeiting:

Throughout history, issuers have faced one common threat: counterfeit banknotes. Security is an obligatory prerequisite in banknote development, and reliability is the only way to build long-term trust in a payment medium controlled by Governments and Central Banks. Banknotes need to have security features backed by sophisticated production processes that cannot be replicated easily by counterfeiters.

Logistics:

Scientific determination of banknote authenticity requires a profound knowledge of the manufacturing processes and raw materials involved. Moreover, Central Banks must specify, manage and control the banknote life cycle, its denominations and scheduled series replacements combined with logistics for distribution. Hence, they need reliable production partners that can deliver security features, special paper and other elements discreetly and on time.

Durability:

There are around 357 billion banknotes in circulation (G+D Currency Technology) today with an average lifespan ranging from 5 – 10 years. Besides strengthening banknotes with new substrates, the security features too must be robust and durable. Central banks were looking for new features that experience virtually no degradation over the lifetime of the substrate.

Easy Authentication:

As banknotes are circulated in the country, they are used by people from different demographics, social backgrounds, careers etc. Hence, they need to facilitate easy authentication in a few seconds, be simple to explain and easy to recognize.

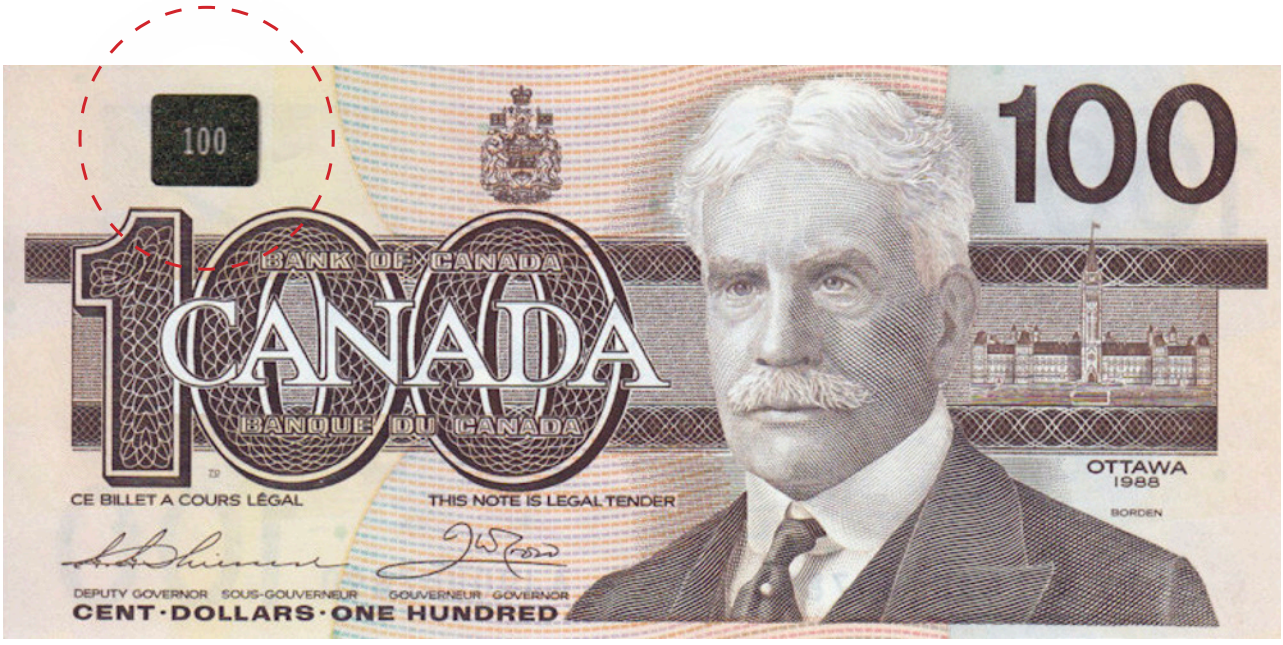
LumaChrome thread on some popular banknotes (adding Kuwait here too)

SOLUTION

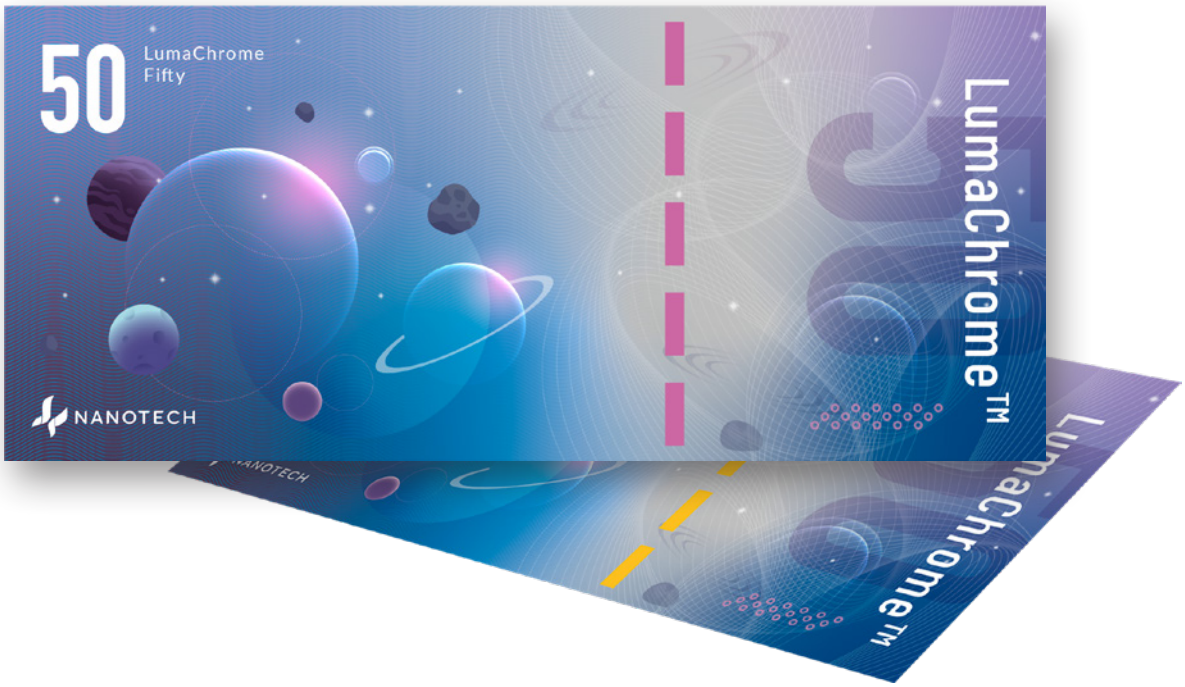
Nanotech's LumaChrome™ colour-shifting foil provides exceptional security and intuitive authentication by way of a simple shift from one colour to a second distinct colour.

LumaChrome colour-shifting film has been employed in the banknote and government market space for more than two decades. Branded as an Optical Security Device (OSD), the technology was first developed by the bank of Canada in conjunction with The National Research Council of Canada. Founded on the science of how light behaves, scientists developed a way to control light using ultra-thin layered optical interference structures combined in such a way that the light reflecting to the observer was controlled to a specific wavelength (colour). The first iteration of this technology appeared on the Birds of Canada note series as a Metallic patch, which shifted colour from gold at normal incidence to green when tilted.

A subsequent adaptation of the technology appeared as a colour-shifting, de-metallized thread in the Canadian Journey series notes. The ability to de-metallize and use the technology to show numerical characters with multiple colour-shifting options, proved the adaptability of the technology and its strong applications in the secured documents industry. Since then, LumaChrome has been used in 30 banknote denominations and multiple secure ID applications in over ten countries.

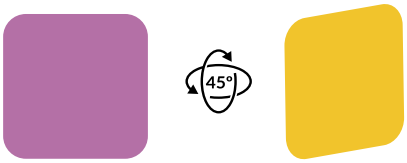


Birds of Canada 100-dollar denomination displaying a colour-shift OSD patch in the upper left corner



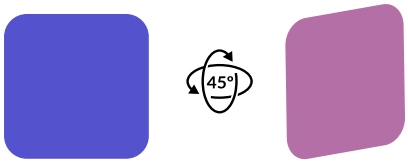
LumaChrome on the housenote

AVAILABLE COLOURS

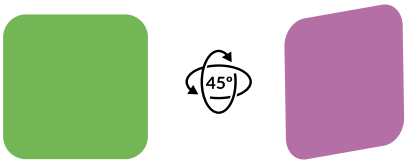


Magenta to Gold

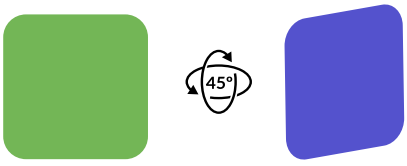
Magenta to Green



Blue to Magenta



Green to Magenta



Green to Blue

Gold to Green

RESULTS

Central Banks and Governments experienced multiple benefits with LumaChrome.

Counterfeiters deterred
The unique combination of layered thin film materials are very difficult to reproduce, requiring a high degree of knowledge in thin film optics and sophisticated production process and equipment. Hence, LumaChrome is a secure, reliable solution that counterfeiters find extremely hard to replicate.

Durable feature
With the ability to create several standard colour-shifts over a wide range of saturation levels, Nanotech created a lasting security feature that experiences virtually no degradation over the lifetime of the substrate. Hence, it lasts the entire duration of the banknote life cycle.

Easy integration
Availability in a metal-dielectric or all-dielectric film in multiple formats from a security patch for government ID cards to full thread insertion into banknotes, Nanotech's LumaChrome is versatile and easily integrates into a variety of substrates.

Quick authentication
LumaChrome offers easy, intuitive authentication through a colour shift from one colour to another in a few seconds. It is simple to explain and easy to recognize at considerable distances, multiple viewing angles, and variable lighting conditions.

Product capabilities
Nanotech has been a consistent and reliable partner for multiple Central Banks. To meet the high-volume production demands, Nanotech utilizes two large roll-to-roll optical thin film deposition coaters. Operating up to four distinct deposition zones simultaneously, each machine has the capacity to produce over 1400m^2 of LumaChrome material per roll. Operating each thin film coater at peak output over a 24h schedule, nanotech has the capacity to achieve more than 8500m^2 of production material each day.

WHY NANOTECH

Nanotech's proven LumaChrome thin-film colour-shifting platform has been a staple to the banknote and secured documents industry, offering effects that are robust, complex to produce and that are available in many formats to meet customer demands. It offers:

Visual effect
Exceptional visual effects through six options of crisp colour shifts (Magenta-Green, Magenta-Gold, Gold-Green, Blue-Magenta, Green-Magenta, Green-Blue)

Technology protection
Protection to Governments from counterfeiters and counterfeit-related economic losses.

Enhanced security
Enhanced security as it is difficult to emulate using other technologies.

WHY INVEST IN NANOTECH

High inside ownership and strong balance sheet with no debt

Disruptive technology
Innovative nano-optic technology used to create customized products that can be embedded onto any surface. More than $15 million invested in nano-optic research

Technology protection
Large patent portfolio wrapped in trade secrets (33 issued patents and 26 patents pending)

Large market opportunity
Anti-counterfeiting and brand protection solutions are required for almost every industry. Expected to reach a value of USD 10785 million by 2024, witnessing a CAGR of 17.48% over the forecast period (2019-2024)

Strong team
Decades of management experience and strong relationship with issuing authorities

THANK YOU

To know more about LumaChrome and our banknote security features, visit www.nanosecurity.ca or contact us at info@nanosecurity.ca

NANOTECH