Solstice

AUTHENTICATION TECHNOLOGIES





A COMPREHENSIVE RANGE OF SECURITY PIGMENTS

Solstice Advanced Materials' Lumilux® Authentication Technologies is a leading manufacturer of fluorescent phosphorescent pigments, dyes and fibers in a wide variety of colors and particle sizes combined with appropriate detection technologies—for an impressive range of applications. Competency, reliability, and trust are key elements of how we do business. We want you to feel completely at ease working with us.

Competence

Our global Lumilux® team has decades of experience in developing and manufacturing pigments, dyes, fibers and optical sensors. Solstice's global resources, technical acumen, market knowledge, and commitment to continual product innovation - with 130 active authentication-related patents and ongoing investment in production capability - all contribute to the competence you can expect from a global player.

Reliability

As a result of our strong expertise in organic and inorganic luminescent product lines and detection solutions, you can rely on our ability to offer unique solutions for the most secure customer requirements. Meeting commitments is one of our key values and part of that commitment is our extensive product testing services, sampling logistics and reliable product support which we have demonstrated in our 50 years of experience working with central banks and governments.

Trust

At the core of our business promise is quality and confidentiality. You can depend on the highest quality and confidentiality. We understand the discrete and imperative nature of your business.

LEADING THE WAY

Solstice's Authentication Technologies for document security

For governments and corporations, it's clear that counterfeiting is becoming an increasingly difficult problem to address. No matter where you are in the world, government-issued ID cards, driving licenses, passports, visas, and residence permits are under attack from counterfeiters. In fact, advanced counterfeiting technologies are driving the demand for more sophisticated authentication techniques and stricter regulations.

Governments around the globe understand that verifying the identities of individuals and regulating travel are paramount to protecting populations and physical assets. They are locked in an escalating battle of authentication methods while trying to stay ahead of counterfeiters and forgers who are using more effective methods to create false documents. Today, new regulations call for increasingly sophisticated protection methods that require prints and substrates, which can be easily identified and are difficult to duplicate.

Upgraded security documents meeting new national and international standards such as ICAO and ISO reflect the following trends:

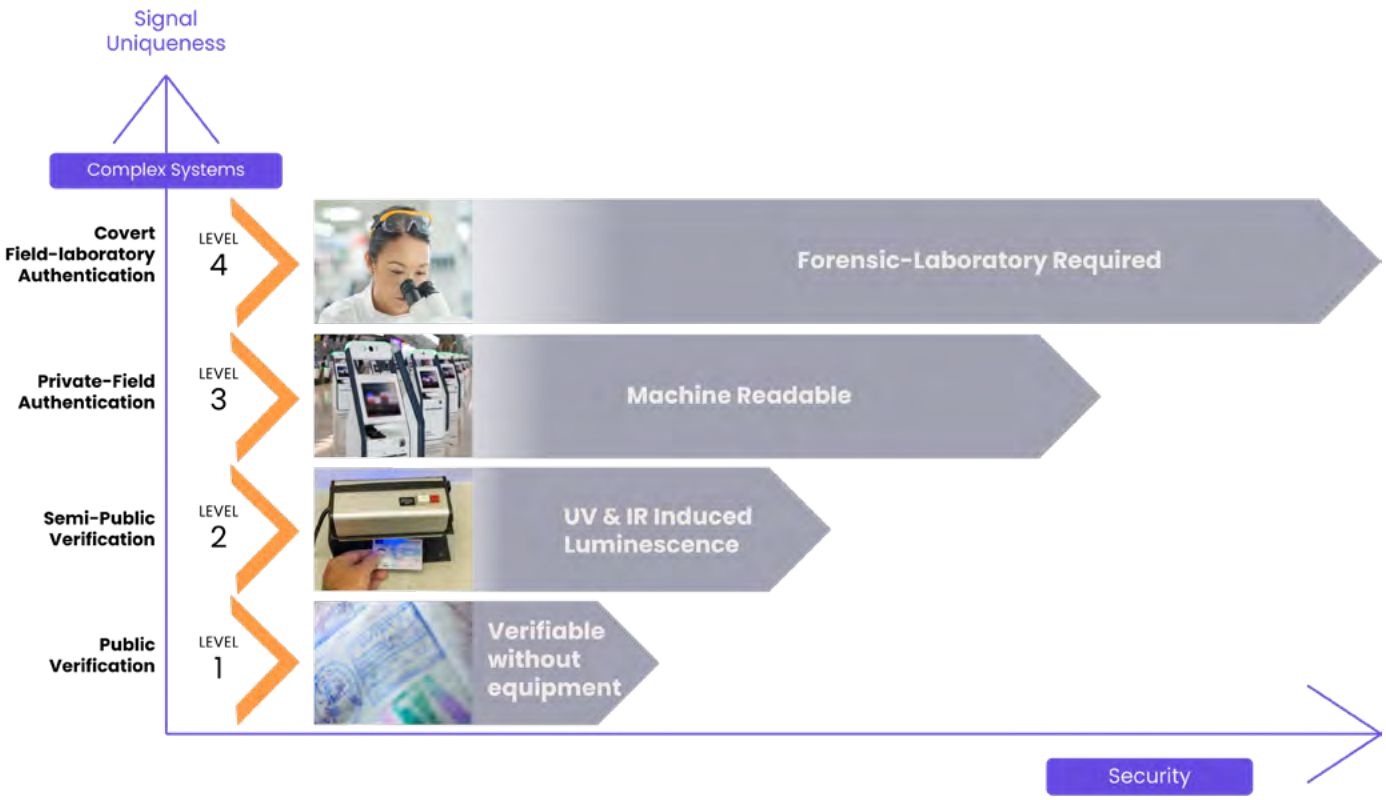
- Replacement of paper by polycarbonate and other plastics
- Lamination of security documents
- Personalized documents via laser engraving and inkjet printing
- Advanced digital security, which is complementary to physical security

Combining these new authentication technologies can make duplication alteration more difficult, while rendering detection more secure. As seen in the graphic below, detection can vary in degree of complexity and sophistication, from Level 1 for public verification under visible light, to Level 4 which requires authentication in a laboratory environment.

In many cases a document examiner may have only a few seconds to determine if a passport or ID card is valid or not valid. Fortunately, Solstice's detection methods and authentication features allow documents to be validated quickly by an inspector or an automated reader.

Solstice helps organizations protect their documents against counterfeiting by designing a complete covert identification system with unique, machine-readable luminescent materials that can be used in a wide variety of high-security documents, especially IDs and passports.

LAYERS OF DETECTION



SPANNING THE GLOBE

> Lumilux® from Solstice ensures a high degree of authentication

Solstice's Lumilux® products are used around the world for passports, driver's licenses and government-issued ID cards. Our specialized pigments can be used in combination with embedded chips and other digital elements to close the loop and ensure higher levels of authentication. Solstice also understands the nuances and regulations of specific regions while offering local support and expertise.

Our product security specialists work with you to develop one-of-a-kind solutions making it extremely difficult for counterfeiters to copy or alter your documents. Most importantly, we give you peace of mind and confidence in the security of your documents.



FLEXIBILITY

Given the critical nature of document authentication, the methods used must be flawless. For governments and document producers, there is a clear need for a partner who brings decades of experience and truly global resources to the relationship. Solstice meets that need. Solstice has a broad range of products and know-how developed over decades of working in the authentication field with countless countries across the globe. As regulations change, it is important to be flexible. Solstice demonstrates this flexibility and is ready to help you meet new requirements.

Whether the requirements are national or international standards such as those issued by ICAO, we can help you solve your latest challenges. Our product support team will work with you to understand your specific needs with confidentiality and trustworthiness.

PRODUCT FAMILY

Working with Solstice, you have access to a large and diverse portfolio of security pigments. This allows us to create unique security combinations with specialized materials.

- Inorganic particles, organic particles, organic dyes, & security fibers
- Absorb light at one wavelength and emit light at other wavelengths (materials can be completely colorless and can have bright visible color)
- Various particle sizes to meet specific needs
- For use in paper, ink, coatings, plastics, films, etc.

For detection, combinations of human-vision and machine detection can be used. For critical requirements, fully customized solutions can be designed, significantly raising the level of security and copy resistance.

PIGMENTS AND DYES

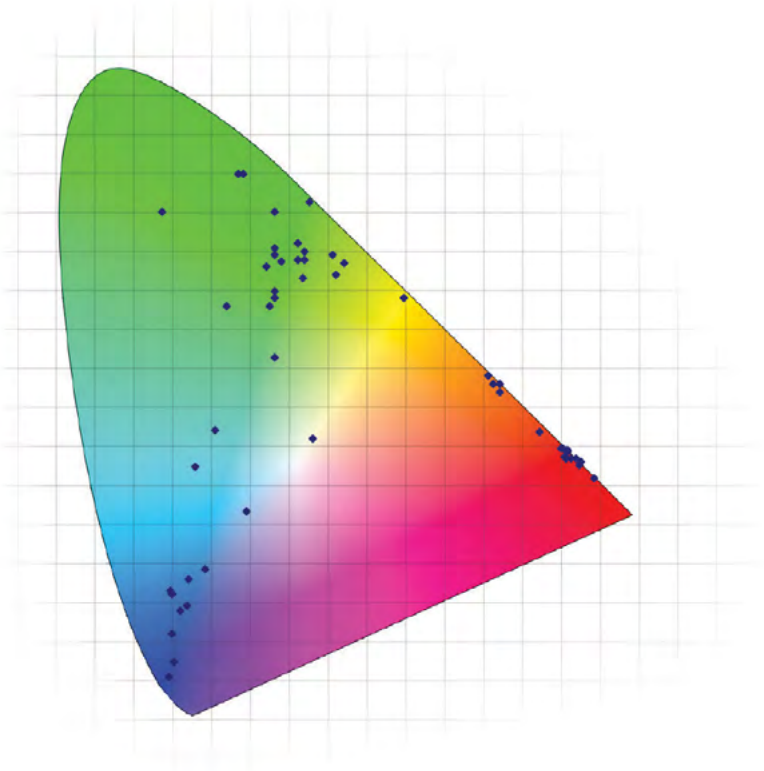
Solstice offers one of the broadest range of fluorescent materials in the world, covering a significant range of emission colors from UV to IR. A variety of blue, green, yellow, orange, and red make it easy to match different application requirements.

Inorganic particles: Many can be excited by ultraviolet (UV) light and typically emit visible or invisible infrared (IR) light. Others (called upconverters) can be excited by IR light to emit in the visible. Inorganic particles can be incorporated in both inks and paper. They are also particularly resistant to high temperature processes such as plastics extrusion and lamination.

Organic pigments and dyes have low specific gravity and very good brightness. They have been applied for many years in conventional inks, such as offset and intaglio. They are also suitable in inkjet inks used in the personalization of documents. Selected organic pigments resist lamination.

Certain pigments and dyes have spectrally-narrow light emission that can be used for effective machine detection. Such line emitters can be used with proprietary detectors to discriminate from conventional UV materials for enhanced security.

CIE XYZ CHROMATICITY DIAGRAM



365 nm Excitation Fluorescent Emission Color Coordinates Lumilux® Fluorescent Pigments

FIBERS

Adding luminescent fibers to paper creates an effect that is very difficult to copy. Fibers have to be added at the mill where the paper is produced. Solstice can provide about 40 different types of fluorescent fibers offering a selection of colors and substrates, including:

- Polyamide
- Viscose
- Other polymeric fibers upon request

Cutting lengths typically range from 3 to 6 mm with fiber size from 3.3 to 22 dtex. UV-excited emission colors include blue, green, yellow, orange, and red, and can be combined with an upconverter. Daylight appearance can range from colorless to brightly colored.

HIGH-SECURITY SOLUTIONS

The most complex and critical applications typically use a combination of security features and need multiple detection methods. Solstice has created many customized lock-and-key solutions with varying levels of security. Whatever the approach, Solstice can help you work through the exact combination you need for the application, including all the necessary taggants and detection hardware. In these situations, the depth of know-how is what matters most to find the best approach to make counterfeits virtually impossible.

DETECTION SYSTEMS

Detection can be set-up in one or more of the following ways:

- For semi-covert solutions, IR and UV light sources can be used to allow observation and recognition with the human eye in the visible spectrum.
- For line emitters, the emission signal can be machine read in the following formats:
  - Field use hand-held with a simple yes/no response production process control units
  - Laboratory quality control units
  - Other custom formats (e.g. high speed readers, or fielded stationary units)

We offer detection solutions for high speed environments, such as those used in automated sorting of banknotes, but can also support low speed or static conditions with the right sensor technology.

SOLSTICE LUMILUX® FOR AUTHENTICATION

For more than 50 years, Solstice has helped governments and monetary institutions meet document and currency security needs with covert luminescent materials and optoelectronic detection systems. These products have a long heritage, going back more than a century to Riedel-de-Haën™, a pioneer in luminescent materials. Today the group has sales and customer support locations around the world, with ISO 9001 certified Six Sigma Black Belt supported manufacturing in Seelze, Germany.



TYPES OF DETECTION SYSTEMS

Handheld detectors for field verification

Uniquely paired with Solstice covert materials, reliable authentication with very low false rates, easy to use and not crackable.

Detectors for quality control

Uniquely paired with Solstice covert materials, measurement of multiple signals independently. Simple to operate, reliable, accurate and gives reproducible results with ability to port out information directly to a laptop.

In-line QC-detectors for production lines

Uniquely paired with Solstice covert materials, installed to production lines for paper, labels and packaging. Reliable measurements at high speed.

COMPETENCE, RELIABILITY, AND TRUST

Benefits of working with Solstice





RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

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For More Information Visit
solstice.com

Solstice Advanced Materials Inc.
115 Tabor Rd. | Morris Plains, NJ 07950

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