

## ADVANCED MATERIALS

### UNEXPECTED DISCOVERY COULD YIELD COUNTERFEITING DETERRENT

They set out to develop tiny optoelectronic devices for faster, denser computing (see page 8). But researchers at Optodot Corporation (Allston, MA) came up with something far different: a new type of security marking that is virtually impossible to counterfeit.

This serendipitous discovery could significantly reduce product fraud, a prevalent and growing problem that results in worldwide losses of \$1 trillion annually, according to Optodot. For example, a simple hand-held scanner could be used to examine suspect products. If the unique security mark is detected, the products are authentic. If not, they are potentially counterfeit.

The key to Optodot's security marking technology is a photochromic ink that is extremely sensitive to ultraviolet (UV) light. The ink is a multicomponent formulation that contains organic semiconductor material. While conducting MDA-funded research on optoelectronic devices, Optodot researchers unexpectedly discovered that electro-oxidation of this material causes it to change color and infrared transparency. This switching rapidly reverses in the dark. By adding certain polymers and additives, the same reversible color change was made to occur in response to UV light.

More specifically, when exposed to UV light, the organic semiconductor changes its color from a light tan to a bright blue and allows more infrared light to pass through it. When the light is removed, the material returns to its original color and infrared transparency.

"The photochromic ink shows excellent durability over time upon storage and repeated photochromic color changes," said Dr. Steve Carlson, Optodot's president. "It also is visually transparent, which makes it very attractive for use in overprinting of printed information."

For example, the photochromic ink, combined with an infrared reflective ink

device would quickly detect this unseen security mark, providing clear evidence of authenticity.

The photochromic ink also could be adapted to measure incident doses of UV light. This capability would be useful in semiconductor lithography processes, which rely heavily on UV light for electronic chip making.

Optodot is showing its security marking prototypes to companies involved in anticounterfeiting, such as those that handle identification cards, currency, bank documents, credit cards, and branded goods. It also spun off a new company, Edison Security Marking, to handle all commercial aspects of this technology. Optodot seeks inquiries from those interested in partnering to explore security and other applications of its photochromic ink.

—P. Hartary



**Blue to the rescue.** Counterfeiters will have a tough time duplicating Optodot's new security marking technology on personal identification cards. The security mark can be made invisible to the eye but visible as a blue rectangle under ultraviolet light, as shown above in the upper left corner of the driver license.

containing organic semiconductor material, can be applied by common ink jet or thermal transfer printing methods directly over bar codes and official documents, such as visas, passports, and driver licenses. The ink could also be used to create an invisible bar code on branded goods, currency, and financial documents to prevent counterfeiting. A simple scanning

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**"A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty."**

—Sir Winston Churchill