

Bayer technology makes cash and credit cards forgery-proof

# The **sparkling** fingerprint

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ID cards



*Cash and credit card counterfeiters are amassing the technical equipment they need to gain fraudulent access to bank accounts, thus boosting the demand for increasingly sophisticated security features. Researchers at Bayer MaterialScience and Bayer Technology Services have developed a system for protecting against forgery that is surprisingly simple and extremely secure.*

Modern robbers have long since given up storming local banks with guns and face masks. Scam artists today are after digital money, meaning the data on customers' cash and credit cards. If you think it's sufficient to keep your PIN separate from your card to protect against abuse, you're wrong. High-tech criminals use tiny cameras and computers, mount bogus keyboards on cash machines and wait for their victims at a safe distance. "Skimming" is the term used by police for this method of obtaining bank and credit card data, and it has been a growing threat over the last three years. A customer inserts his card into a manipulated cash machine and a device swipes the data. The customer notices nothing and unknowingly punches in his PIN, which the criminals

read by way of miniature camera. The rest is routine: the skimmers take the information stored in the false card reader, transfer it to the magnetic strip on another card, and use the new card to withdraw cash undisturbed. But cash and credit cards are not the only target of well-organized gangs; their list also includes, for instance, gas cards.

### International gangs cause damage amounting to millions

The German Federal Criminal Police Office (BKA) in Wiesbaden is aware that existing protection strategies can hardly keep up with advances in criminal tactics. The Hesse State Ministry of the Interior estimates the financial damage from skimming at €50 million

Guaranteeing security: Mehmet-Cengiz Yesildag and Dr. Markus Gerigk (photo right, left to right) developed the innovative Makrofol® ID ProteXXion plastic film that makes bank and credit cards forgery-proof. The authenticity is checked by a quadruple-track scanner that uses a laser to read the cards (photo left).





Test station: the ProteXXion® security system uses a laser (photo above) to scan the metal platelets embedded in the film before comparing this pattern with the one in the database. Lab technician Kira Planken (photo right) reviews the quality of the transparent Makrofol® plastic film used in this application; it is only about 100 micrometers thick.

in Germany in 2008, or two times that of the previous year. The gangs work internationally and are well networked. For this reason, according to the BKA, old and new security techniques must be combined more rigorously to put a halt to their activities.

Researchers at Bayer MaterialScience have now developed a material that makes all ID cards, including cash and credit cards, extremely secure: innovative Makrofol® ID ProteXXion plastic film. For some time Bayer MaterialScience has been manufacturing a variety of films which are layered like a sandwich to make ID or credit cards or driving licenses.

### Ultrathin metal platelets embedded in plastic

Two years ago, specialists at Bayer MaterialScience hit upon the idea of incorporating tiny metal particles, called OVDots (optical variable dots), in the transparent plastic film. Although these thin platelets are just 100 micrometers in diameter, they can still be imprinted by laser with numbers, letters or even symbols, such as state seals. To the naked eye, OVDots on a card look like glitter. Customs agents or policemen can easily see the dots using a pen-size microscope

and reliably identify forgeries. The first identification cards with OVDot films are already in circulation. However, to create a simple, easy-to-use, forgery-proof film, the specialists at Bayer Technology Services first had to spend the last two years improving on a second technology: ProteXXion®, a system originally designed to protect against product forgeries, such as replacement parts, electronic devices, medicines and high-end consumer goods (see also *research* 19, page 80: "The war on product counterfeiters"). The idea: every surface, be it plastic, metal or paper, has unique, microscopic structural features, meaning that every object has its own individual fingerprint.

With ProteXXion®, a laser scans the surface of an object or package and sensors register the reflected light. Because of the distinctive microstructure, the light signal produces a unique pattern for each object.

ProteXXion® transforms the pattern of light into digital signals, compresses the data and generates a characteristic identification code, which is finally stored in a database before a product goes to market. Sellers can then scan a product themselves and verify its authenticity via the Internet by comparing it with the fingerprint in the database.

A year ago, the Bayer researchers resolved to merge their security technologies, combining the OVDot film with the ProteXXion® laser system to obtain a new anti-counterfeiting feature. Now, the laser scans the film with the metal platelets and, from that reflected pattern of light, the ProteXXion® code is generated and stored in the database. "Because the metal platelets are distributed in purely random fashion when the film is manufactured, no two codes are ever alike," says Dr. Markus Gerigk, Head of Authentication Solutions at Bayer Technology Services in Leverkusen.

### Absolutely forgery-proof security feature

What's more, the laser system recognizes not only the exact position of the OVDots, but also if they are at an angle or parallel to the beam of light. The result is a highly complex signal that is absolutely forgery-proof. "Some security features are strictly confidential to prevent imitation," Gerigk explains. "But we can talk openly about our method, because the mark, including the signal analysis logic and the encryption, is impossible to forge." Together with his co-workers, Gerigk is busy adapting the ProteXXion® system to the new applica-



Plastics expert: Laboratory Manager Dr. Heinz Pudleiner and his colleagues developed the innovative technology that embeds the metal particles in the ultrathin film.

tion, but he has already determined that Makrofol® ID ProteXXion does the job.

### Innovative technology to beat product piracy

Until they were certain, however, the researchers had several hurdles to clear, particularly for the OVDots. For example, the Bayer MaterialScience specialists first had to modify their production process to make the thin films. As it is, the extruders spit out the plastic as continuous product. "It was very tricky in the beginning to incorporate the tiny metal particles into the viscous plastic such that they were flat in the plane after extrusion," explains Laboratory Manager Dr. Heinz Pudleiner from Bayer MaterialScience. Because the film itself is only about 100 micrometers thick, the particles must not turn upright, or else they could puncture the plastic. In the early project phase, the extruders crushed the platelets, which then left the line totally deformed. As a result, the microsymbols engraved on them were hardly legible. Pudleiner and his team kept modifying the extrusion process until the OVDots were positioned flat in the film and totally intact. The researchers have already applied for a patent on the new technology.

# Interview

## "The number of manipulation cases is on the rise"

Mechthild Schlitz is the national representative for crime prevention in the Bank Security department of the Hesse State Office of Criminal Investigation in Wiesbaden. *research* spoke with her about counterfeiters and their methods.



### How great is the risk of credit card fraud today?

The number of cash machine manipulations in Germany has been on the rise since 2001. A total of 2,400 cash machines were compromised in 2008. In addition, during the same period, cards were accessed abroad at 514 cash machines or other point-of-sale (PoS) terminals.

### What is the most common method counterfeiters use?

Skimming is very widespread. Small, electronic storage modules are mounted on the card slots, which read the data on the magnetic strip. That's why access control devices on doors pose an additional risk. The perpetrators get the PIN by peering over your shoulder, installing hidden miniature cameras or using

a mobile telephone camera. They subsequently transfer customer data to blank cards. Skimmers use the cards until the account is emptied or blocked.

### What countermeasures are being taken?

One good means of protection is the EMV chip, the small, square chip you see on the front of a credit card which prevents unauthorized access to card data by means of encryption. New cards already include this chip. Other technical features naturally can enhance security. But anticounterfeiting measures today encompass more than just cards; they also aim to protect against imitation products on the global market. What is critical for the future is for government agencies and industry to maintain a continuous dialog about all aspects of security.

Mehmet-Cengiz Yesildag, Head of Marketing, Functional Films at Bayer MaterialScience in Leverkusen, is certain that the metal platelets, coupled with the ProteXXion® laser scan, are an extremely reliable system for the market. "Some identification cards already have up to 30 different security features, such as watermarks or holographic symbols. But each additional feature makes a card even more secure," Yesildag points out. "Ultimately, the strategy is to make life so difficult for counterfeiters that forgery doesn't pay or, as with our system, is utterly impossible." Yesildag has his eye on more than just cash and credit cards: the new Makrofol® ID ProteXXion system is suitable for many other high-end goods encapsulated in durable,

transparent films, such as smartphone housings. As a security double pack comprising embedded metal platelets and a laser scan, Makrofol® ID ProteXXion could make a significant contribution to protecting against forgery, particularly since the economic damage due to product piracy is even greater than that of data theft at the cash machine.

[www.protexxion.de/en/home.html](http://www.protexxion.de/en/home.html)



This Internet site provides more information about Protexxion®.