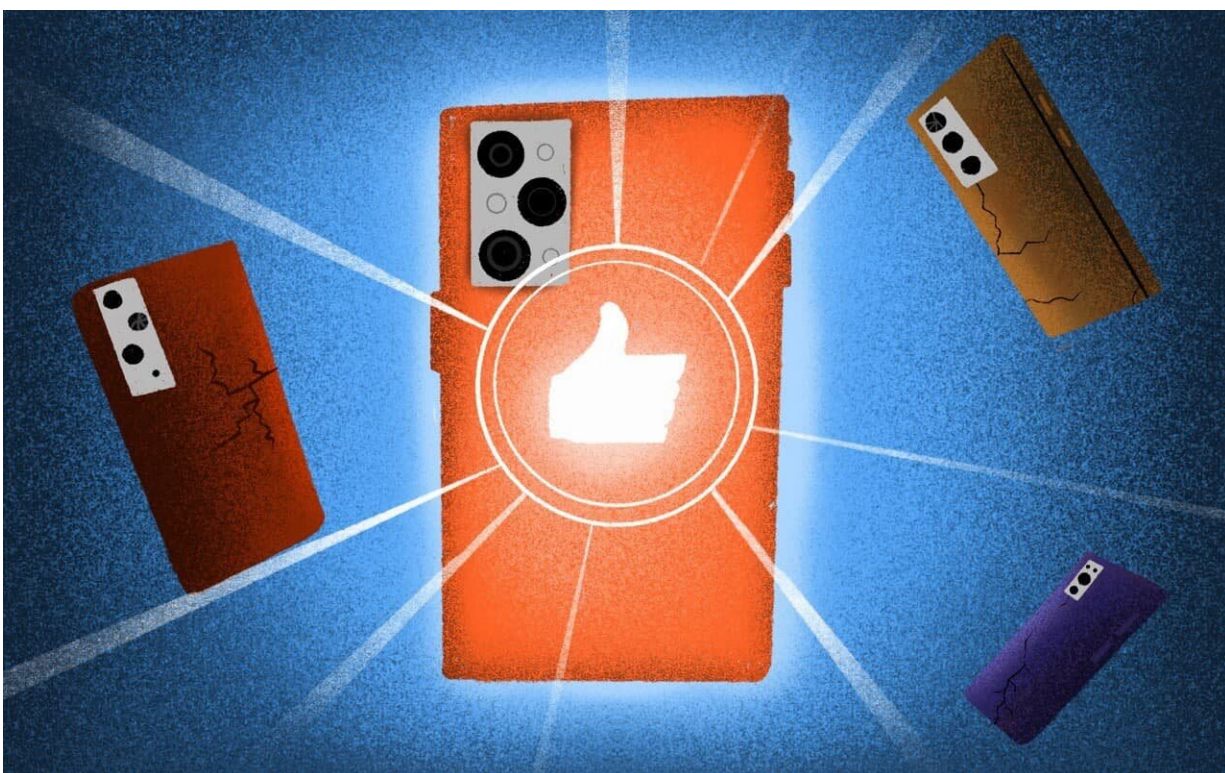


Scientists develop invisible anti-counterfeit labels

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Credit: Dmitry Lisovsky for ITMO.NEWS

Researchers from ITMO University and St. Petersburg Academic University developed a new technology for marking authentic goods. Manufacturers will be able to label electronics, drugs, jewelry, and other products with invisible images that can only be seen with special

equipment. These labels will help protect the goods from forgery. The research is published in *Advanced Materials*.

Companies all over the world are looking for ways to protect their goods from counterfeit. But the available methods offer only temporary solutions. As soon as wrongdoers discover a way to get through the existing protective measures, the technology becomes useless. Russian scientists have proposed new labels that are not so easy to decipher. They are made from semiconductor materials with the help of lasers.

"With a laser, we add ions of a rare-earth metal called erbium that create a unique image on a sticker made of a silicone nanofilm. To do that, we first make a lattice of holes on the film that are invisible to the naked eye. Some of these holes contain erbium ions, others don't. When subjected to [laser radiation](#), the holes with erbium change color—and thus they allow us to correctly read the image," explains Dmitriy Zuev, head of the project, assistant professor at ITMO's Department of Physics and Engineering.

It may take wrongdoers a long time to discover the contents of such images. In order to do that, they would have to get into the shipment system, learn to work the equipment, and master [label](#) reading methods. These labels are made even more secure due to several customizable characteristics.

"Our labels are based on erbium ion luminescence, which is characterized by several parameters: intensity, wavelength, and radiative lifetime. A combination of these parameters allows us to create additional layers of protection. That's why when you get the hidden image with an infrared sensor, you will also be able to read the information about the luminescence parameters. This provides an additional degree of protection," says Artem Larin, a Ph.D. student at ITMO's Department of Physics and Engineering.

The developed system is resistant to chemical and mechanical effects, it also can be made on a flexible film. According to Ivan Mukhin, head of a laboratory at St. Petersburg Academic University and a researcher at ITMO, all of this adds to the technology's potential to be introduced into the real sector of economy.

More information: Artem O. Larin et al. Luminescent Erbium-Doped Silicon Thin Films for Advanced Anti-Counterfeit Labels, *Advanced Materials* (2021). DOI: 10.1002/adma.202005886 , onlinelibrary.wiley.com/doi/full/10.1002/adma.202005886

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