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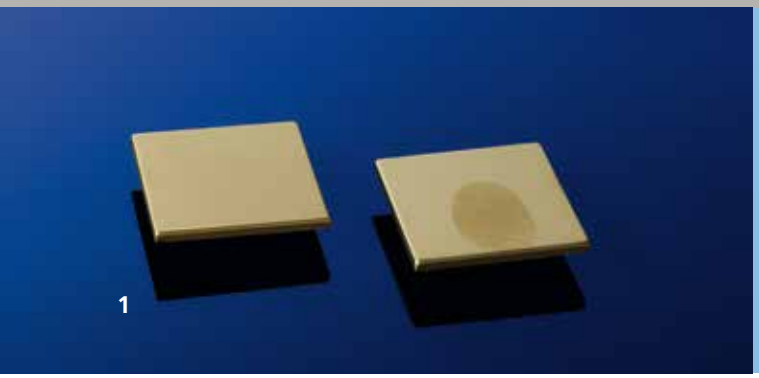
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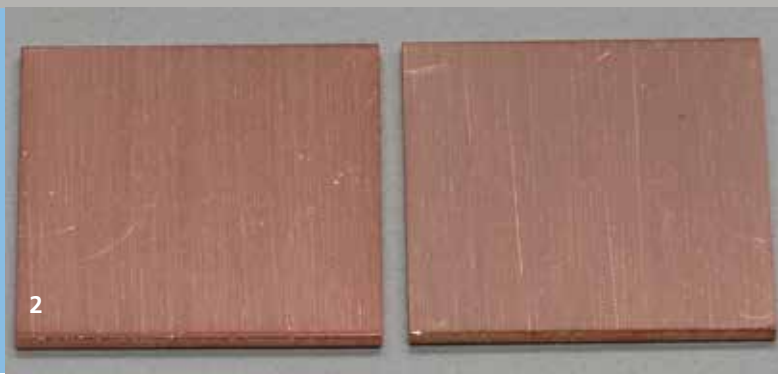
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1 *Non-coated brass surface with invisible (l.) and visible Fingerprints (r.).*
2 *Coated (l.) and uncoated copper surface (r.).*

NEUTRAL-COLOR LIGHT$^{PLAS®}$ FUNCTIONAL COATINGS FOR METAL SURFACES

Challenge – Retention of optical appearance

Besides the actual functionality of a component or product, another important aspect is the perception of its surface.
Metal surfaces, for example, are more appealing and attractive than plastic surfaces due to their color and ability to reflect light. The haptic properties of the "cold" metal and its surface structure are also valuable. It is often necessary to protect the surfaces of metals for long-term retention of the optical and haptic properties. Unprotected surfaces can be prone to, amongst other things, corrosion and scratching.
An invisible but protective layer is thus needed for metal surfaces.

Light$^{PLAS®}$ coating technology

Light$^{PLAS®}$ technology is a novel process developed by the Fraunhofer-Gesellschaft which uses VUV (vacuum-ultraviolet) light to generate functional coatings.

The coating process involves two steps. Firstly, a liquid precursor is applied to the substrate surface. Secondly, VUV light crosslinks the precursor molecules to form the functional coating. These coatings are thin, amorphous, three-dimensionally crosslinked layers (typical thickness 0.3 – 10 µm). They have high resistance to heat and chemicals.

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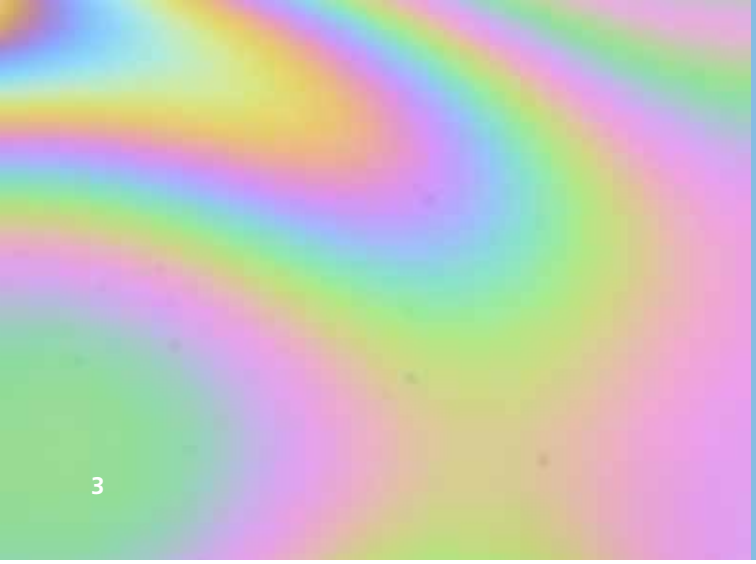

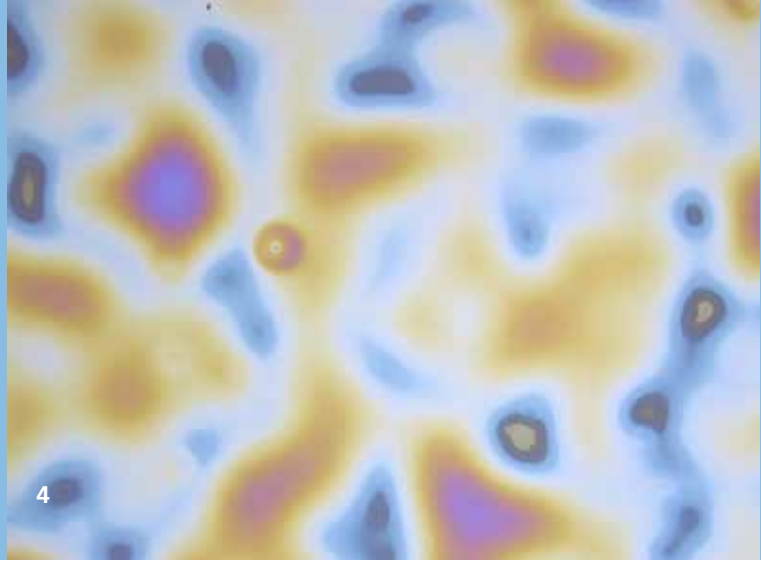

Light$^{PLAS®}$ technology can be used to generate a variety of functional layers including corrosion protection layers, anti-tarnishing layers, scratch-resistant layers, and anti-fingerprint coatings.

Invisible functional coatings

Lacquers are known to provide protection for the surfaces of metals. Having a typical layer thickness above 10 µm, however, they tend to level out the surface topography. As a consequence, the perceived temperature of the metal changes – the metal takes on a warmer effect and the reflection properties of the surface also change – meaning the layer becomes visible. On the other hand, thin homogeneous functional layers having a thickness of less than a few microns cause interference colors. This optical effect is known from soap bubbles. This results in the metal surface appearing colored and the natural color of the metal is negatively influenced.

Light$^{PLAS®}$ technology allows the generation of thin but **invisible functional layers**. This is because the coating that is generated has a non-uniform layer thickness. The resulting interference colors are so close to one another on the surface that the eyes cannot resolve them. This effect is similar to that of the individual color pixels on a television screen or printed photograph.

In order to manufacture neutral-color coatings, the different colors of visible light, the rainbow colors, must be very close to one another on the surface (Figures 5 + 6). The eyes then combine all the colors and we see them as "white light".

Portfolio of Fraunhofer IFAM

The Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM is your expert R&D partner in the area of functional coatings. The range of services we offer include:

- Samples of coatings
- Development of customized coatings
- Pre-production runs
- Adaptation of existing processes
- Analysis of processes
- Quality assurance concepts
- Testing of coatings

Fraunhofer IFAM can also provide assistance with designing customized coating plants to meet your specific needs.

3 + 4 *View of neutral-color coatings under a microscope.*