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Professor Young Min Song's research team develops hidden display that is invisible to the naked eye (National Research Foundation of Korea)

□ Let's say you want to attach the winery's history to a wine bottle with an elegant and concise wine label, but this is not easy considering the overall design of the wine bottle. Although you can include the information in a QR code, please pay attention to this research if you do not want to use a QR code.

- While there is a lot of research on polarizing displays that are invisible to the naked eye but appear when the light and polarization are in a specific direction, significant achievements have been made at Gwangju Institute of Science and Technology (GIST, President Kiseon Kim).

* polarization: In general, electromagnetic waves are a mixture of light vibrating in all directions, or they can obtain light polarized in a specific direction by using a specific mineral or optical filter.

□ GIST School of Electrical Engineering and Computer Science Professor Young Min Song's research team has developed an ultra-thin polarizing display that can express different colors according to polarization by depositing a myriad of nano pillars at an angle.

- This is also attracting attention as an optical security technology that prevents exposure of unwanted information when information is recorded and shared

through product packaging or IoT that provides information without compromising aesthetics.

- Conventional polarizing displays are only a few micrometers due to the difficulty of precise nanopillar alignment and are difficult to attach to various surfaces.
 - For this reason, implementing a polarizing display with a flexible material with a larger area is the key to increasing its practicality.
- The research team succeeded in depositing the self-aligned nanocolumns * on a flexible substrate in a wide area measuring centimeters by using glancing angle deposition method **.

* self-aligned nanocolumns: aligned nanocolumns that can be fabricated through simple physical deposition without complex nano processes like photolithography

** glancing angle deposition method: A method of depositing material obliquely on the surface of a substrate. In this study, porous thin films are deposited.

- In addition, to reproduce colors similar to those of various products, it is possible to realize more than 80% of the standard RGB color space * .
 - They also designed a range of color difference ** to control the sensitivity to hide and reveal patterns for different applications.

* standard RGB: Monitor and printer standard RGB color space created in 1996 by U.S. computer companies Microsoft and HP.

** color difference: It is a quantitative calculation of the degree of color difference for two different colors. The larger this value, the larger the color difference perceived by humans.

- In addition polarizing light, it was designed to respond to environmental changes (e.g., moisture) and also implements a function that reveals patterns hidden when water touches a surface. It can be used to detect contamination from storage environment such as moisture or the external environment.
- GIST Professor Young Min Song said, "This achievement is meaningful in that it implements polarized displays with very thin thickness with simple processes and small amounts of material. It is able to implement variety of colors and has wide area and flexible characteristics. Furthermore, it can contribute to the development of optical information security systems."
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