Electromagnetic wave shielding flexible films with near-zero reflection in the 5G frequency band

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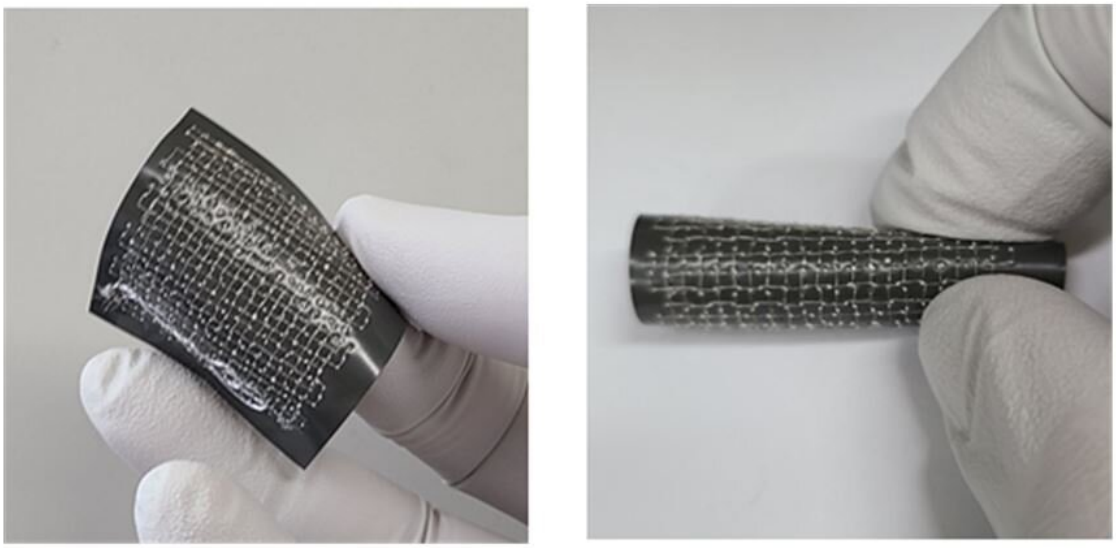


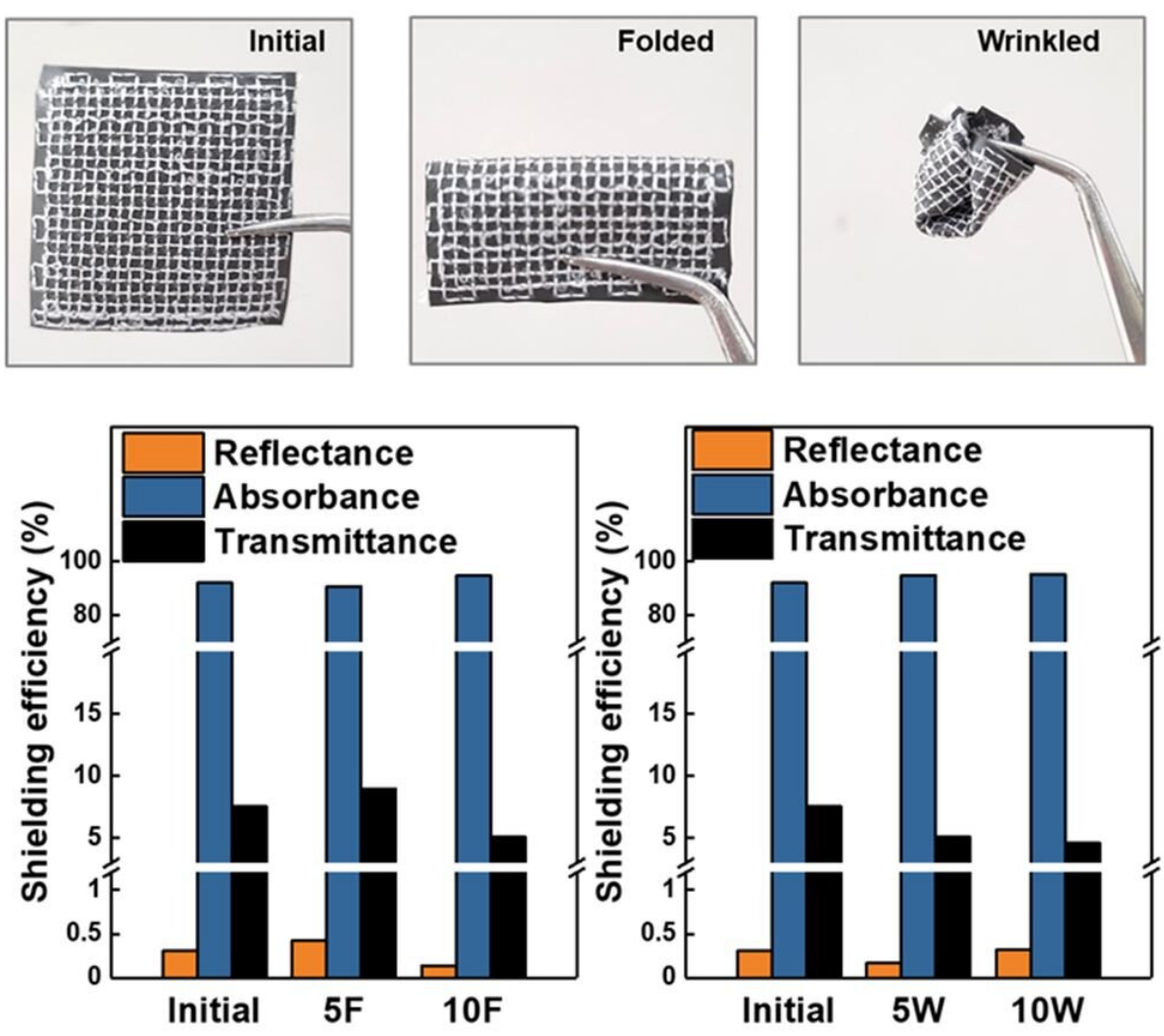
5G electromagnetic wave absorption shielding film developed by the research team at KIMS. Credit: Korea Institute of Materials Science (KIMS)

A research team led by Dr. Sang-Bok Lee and Byeongjin Park in the Department of Functional Composites at the Korea Institute of Materials Science (KIMS) succeeded in developing the world's first ultra-thin composite film. This film does not reflect electromagnetic waves for 5G communication but absorbs more than 90% of it. The technology can solve the secondary interference problem of electromagnetic waves for

5G communication frequency over 26 GHz.

Electromagnetic noise caused by electronic components interferes with other electronic systems and deteriorates their performance. To prevent this, a shielding material is used to block uninterested electromagnetic noise from the components. Existing reflection-dominant shielding materials that are highly conductive, like metal and carbon, reflect more than 90% of electromagnetic waves, so the actual absorption rate is less than 10%. 5G communication uses frequency bands higher than 26 GHz, which is 10 times higher than the frequency of the existing 3G/4G. As the secondary interference of electromagnetic noise is more severe with high frequency and short wavelength, there is a high demand for shielding materials with high absorbing capability.

The absorption-dominant shielding material manufactured by the research team is a magnetic material and polymer-mixed composite film with conductive fibers sewed in a grid shape, which absorbs electromagnetic waves at 5G communication frequencies. This material absorbs more than 90% of electromagnetic waves while it reflects less than 1% of the wave. In addition, as this material is thin and flexible, there was no performance deterioration after it was wrinkled or folded.

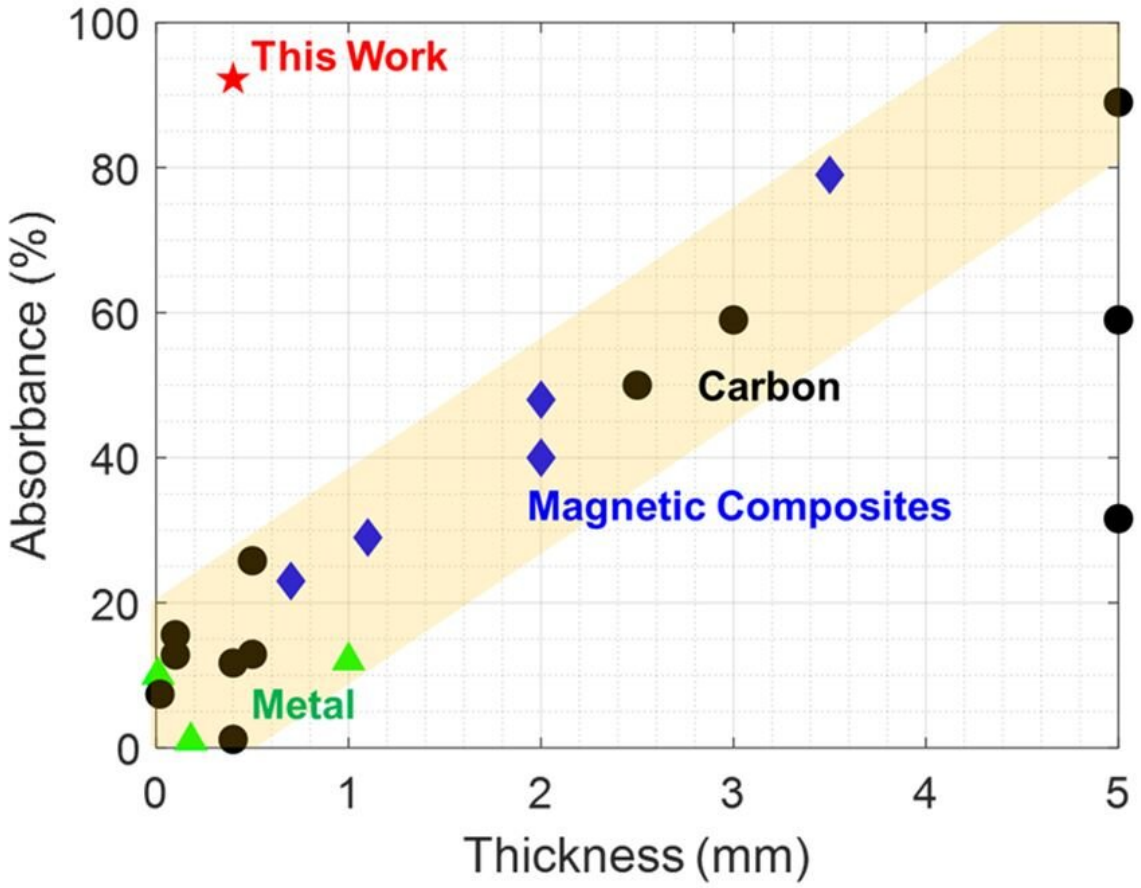


Photos and graphs showing that the 5G electromagnetic wave absorption shielding film maintains its performance even when folded or wrinkled and then unfolded. Credit: Korea Institute of Materials Science (KIMS)

The absorption-dominant electromagnetic wave shielding material technology can be used in various fields, including smartphones that use 5G/6G communication, base stations (small cells), automotive radars, and low-orbit communication satellite antennas. In particular, only two or three companies in the United States, Germany, and Japan have

succeeded in commercializing the technology as these materials require state of the art material design technologies to show advanced performances for the 5G/6G frequency bands.

Principal Researcher Sang-Bok Lee, who led the research, said, "The material we developed uses a conductive grid to present a new concept of an ultra-thin material that absorbs most of the electromagnetic waves without reflecting them. If the technology is applied to wireless communication devices such as smartphones, as well as to automotive radars, the reliability of autonomous driving will be greatly improved."



Performance comparison with existing materials (Existing materials have to be thicker to increase absorbance (yellow area), but the proposed material can

achieve high absorbance with a thin film by using conductive grids). Credit: Korea Institute of Materials Science (KIMS)

The research paper was published in the *Journal of Materials Chemistry A*.

The research team is discussing technology transfer for mass production of absorption shielding material with multiple companies. They are also conducting further research on the material's application to the ADAS radar systems.

More information: Seung Han Ryu et al, Electromagnetic wave shielding flexible films with near-zero reflection in the 5G frequency band, *Journal of Materials Chemistry A* (2022). DOI: 10.1039/d1ta10065c

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