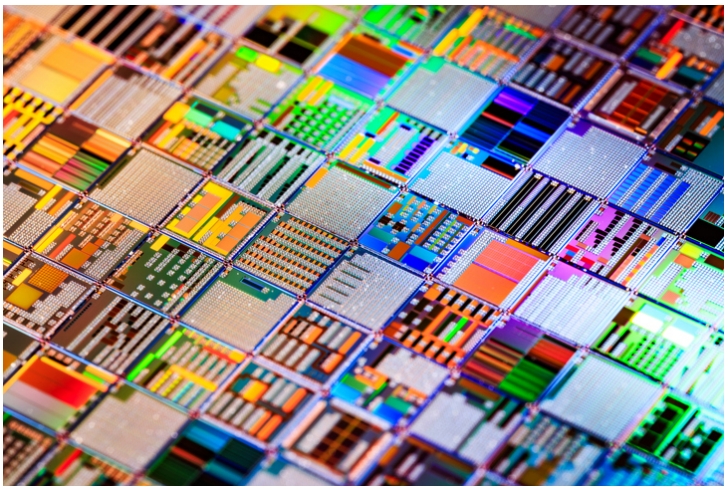
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Multifunctional Thin Film Stack Based Plasmonic Color Filters

TECHNOLOGY NUMBER: 4628



OVERVIEW

Photonic color filters for color display and energy harvesting applications

- Combines color filter with energy generation for improved efficiency in displays and image sensors
- E-books, mobile devices, and decorative photovoltaic panels

BACKGROUND

Color filters are fundamental components in most traditional display technologies, predominantly utilizing chemical pigments to achieve desired hues by absorbing complementary colors. This absorption leads to significant energy waste, as most of the light energy absorbed by these pigment-based filters is not utilized effectively. Historically, the emphasis in energy-efficient technologies has primarily focused on photovoltaic, thermoelectric, and piezoelectric solutions. However, much of the effort has overlooked the potential energy recovery opportunities within everyday display devices, such as LCDs, where only a small fraction of backlight becomes visible to users. Given the high prevalence of such filters across consumer electronics and display technologies, there is an increasing demand for innovative solutions that not only produce vibrant and accurate colors but also reclaim wasted energy. The integration of energy-harvesting capabilities into standard display components could address these unmet needs, enhancing overall energy efficiency and sustainability.

Technology ID

4628

Category

Manufacturing Process
Engineering & Physical Sciences
Semiconductor, MEMS, and Electronics

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INNOVATION

Researchers at the University of Michigan have developed dual-function color filters. These filters are capable of reflecting specific colors while simultaneously converting absorbed light into electricity, driven by optical resonance effects in nanostructures like nanoholes and nanoslits. The use of organic semiconductors in these filters allows for the generation of vibrant, reflective colors in a CMY (cyan, magenta, yellow) scheme. By employing OPV technologies, the invention offers low-cost, easily fabricated, and flexible solutions suitable for large-area applications. This dual-function system is particularly advantageous for outdoor use and under direct sunlight, capturing more energy than traditional transmissive technologies. Real-world applications include the development of energy-efficient e-books and mobile devices as well as the potential for decorative, energy-generating OPV panels that complement efforts to improve power conversion efficiencies in solar technologies. This innovation signifies a major step towards creating more sustainable electronic media.

ADDITIONAL INFORMATION

REFERENCES:

Hui Joon Park, Ting Xu, Jae Yong Lee, Abram Ledbetter, and L. Jay Guo, ACS Nano 2011 5 (9), 7055-7060, DOI: 10.1021/nn201767e

INTELLECTUAL PROPERTY:

US8547504 "Display device having plasmonic color filters and photovoltaic capabilities"