

Breakthrough in micro-device fabrication combines biology and synthetic chemistry

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Nanostructured micro-devices may be mass produced at a lower cost, and with a wider variety of shapes and compositions than ever before, for dramatic improvements in device performance by utilizing very small biologically produced structures. These entirely new biologically-enabled approaches are detailed in the current issue of the International Journal of Applied Ceramic Technology, published on behalf of The American Ceramic Society.

This study's newly invented approaches for the low-cost mass production of micro-devices could yield unprecedented breakthroughs in genetically engineered microdevices (GEMs) for biomedical, computing, environmental cleanup, defense and numerous other applications.

Conventional microfabrication processes, similar to methods used to make computer microchips, are expensive (i.e., capital equipment intensive) and not well-suited for directly producing large numbers of complex, three-dimensional, nanostructured devices with a wide variety of chemistries and properties. Nature, on the other hand, provides spectacular examples of micro-organisms that synthesize microscopic nanostructured shells with well-controlled and highly-reproducible 3-D shapes and features currently unattainable by manmade processes. However, the naturally occurring diatom microshells do not have the specific properties needed for device applications, such as electrical conductivity, biocompatibility, thermal stability, and chemical compatibility.

According to the study's lead author, Kenneth Sandhage, "By demonstrating that biologically derived structures can be chemically modified without changing the starting shapes or fine features, we have opened the door for new research and development in the processing and application of many devices that would otherwise be very difficult or expensive to produce."

Source: Blackwell Publishing Ltd.

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