Multimaterial and Complex Parts

Imagine a part composed of multiple materials that can be made without seams or joints. Or a component with intricate shapes and complex geometry that can be fabricated as a single unit. By eliminating the weakest parts of components, the seams and joints, the products we use every day could be transformed. The ability to build complex geometries would make new products possible.

Additive manufacturing, the building of materials layer by layer and with high precision, is now turning this dream of complex, multimaterial components into a reality. Additive manufacturing allows designers the option of building a part as a single unit, from multiple materials, from the inside out. This capability improves the precision of the product's fabrication and reduces material waste.

Researchers at Lawrence Livermore National Laboratory are already designing and fabricating components composed of several materials, layered together in complex geometries. LLNL and its partner researchers have developed prototype additive micromanufacturing equipment that can generate parts with feature sizes down to the submicron level. Additionally, materials can be changed in and out as desired. Fabricating a part at this length scale and with mixed materials allows creation of components that simply could not be made previously.

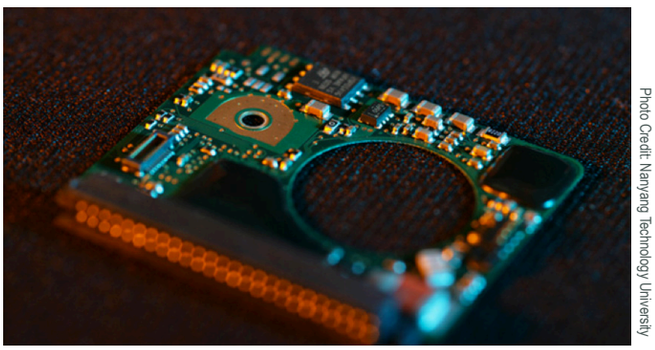
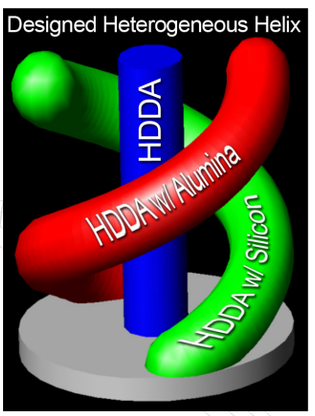


Photo Credit: Nanyang Technology University

Complex nanoelectronics could realize vast improvements from multimaterial additive manufacturing technologies.



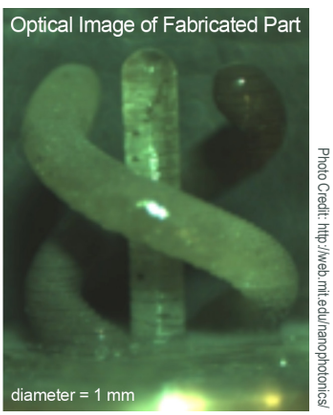


Photo Credit: http://web.mit.edu/nanophotonics/

The resin used in this part, made with projection microstereolithography, is composed of ceramic and metal nanoparticles. Images courtesy of Prof. Nicholas Fang's Research Group at MIT.

LLNL is conducting research on multimaterials for many applications:

- Precision laser targets with layered spheres
- Optical mounting hardware with designed thermal expansion, providing better performance with fewer parts

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