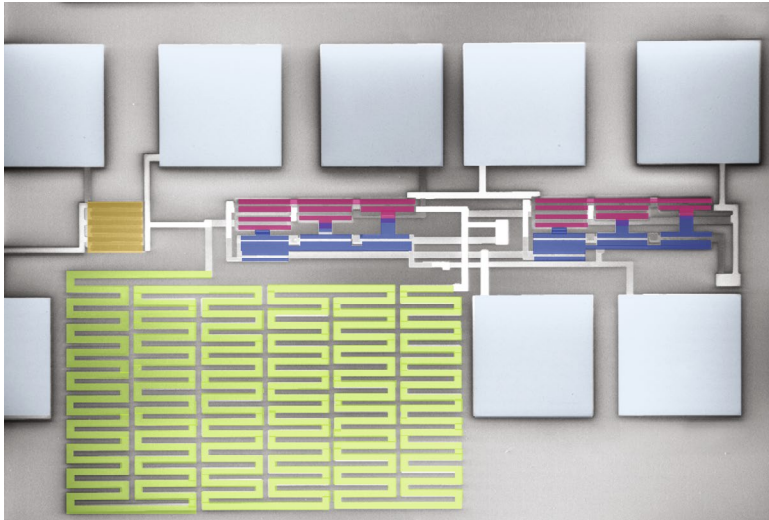


NANOELECTRONICS

Nanotube circuits go analogue

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Credit: IEEE

Carbon nanotube field-effect transistors (CNFET) could be of value in the development of digital integrated circuits because of their superior carrier mobility and ultrathin body, compared to conventional silicon FETs. However, analogue elements, such as operational amplifiers (op-amps), are indispensable for a variety of applications, including sensing, and nanotube-based analogue circuits have so far received much less attention than nanotube-based digital circuits. Max Shulaker and colleagues at Massachusetts Institute of Technology have now demonstrated analogue circuits based on carbon nanotube complementary metal-oxide-semiconductor (CMOS) technology.

The researchers fabricated analogue circuit blocks — two-stage op-amps — that

exhibited a high gain of more than 700 and high linearity, even at scaled supply voltages (below 500 mV). Furthermore, using the two-stage op-amp block, they built an analogue interface circuit integrated with a CNFET-based breath sensor. To test the performance of the system, Shulaker and colleagues exposed the sensor to alternating intervals of warm breath and nitrogen gas, and found that the sensor could detect breath. In addition, the sensor showed minimal voltage drift during d.c. measurements over 12 hours.

Christiana Varnava

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