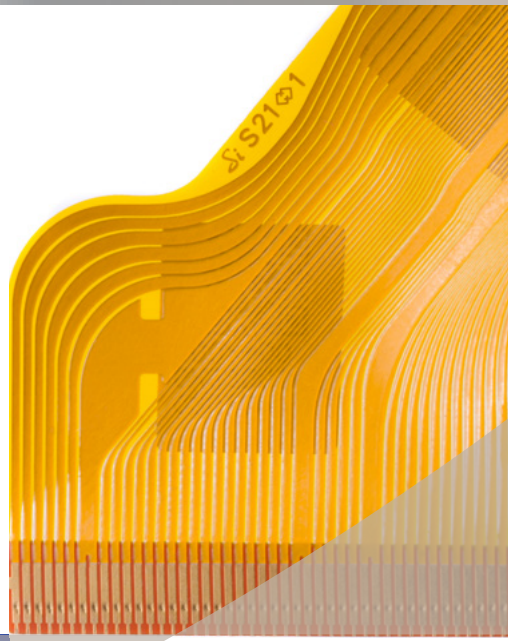
WEARABLE FLEXIBLE ELECTRONICS:

CLOSING TECHNOLOGY GAPS



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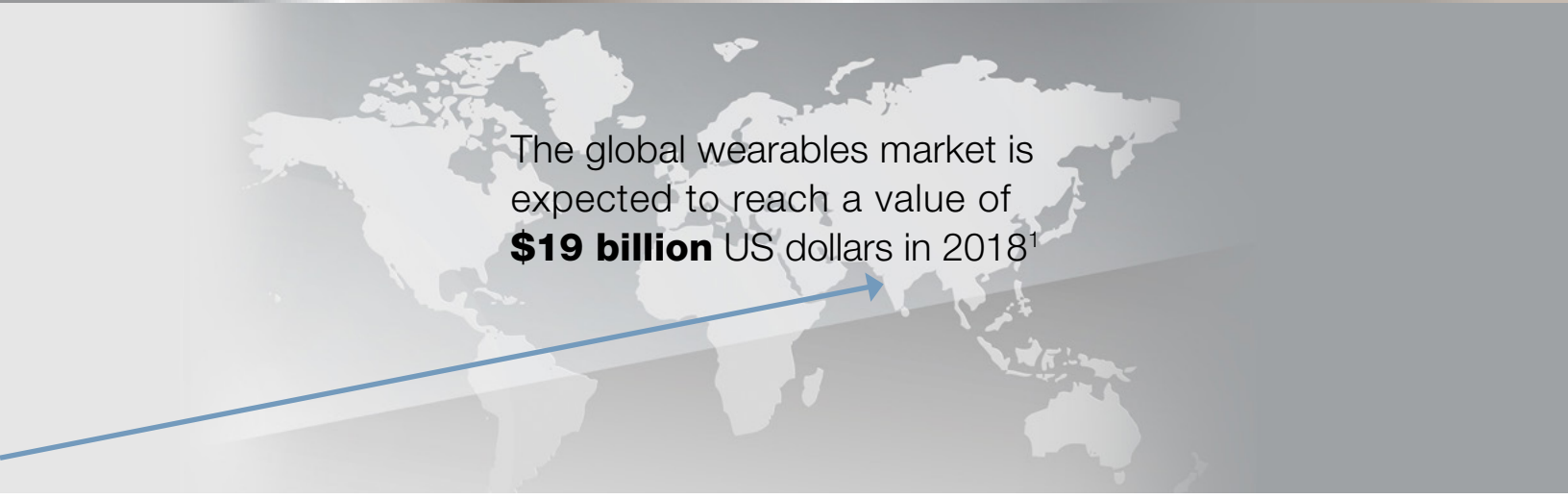


THE PROMISE OF WEARABLE TECHNOLOGIES has tantalized manufacturers of consumer electronics and healthcare products for years. Now, the market for wearable electronic devices is poised to explode. From their initial introduction, wearable electronics have evolved beyond products that were once considered "just gadgets." From health trackers to headgear, smart watches to smart clothes, applications of wearable technology are now emerging in the form of highly desirable products for a wide range of consumers. The new market for such products ranges from expectant mothers to aging baby-boomers interested in taking charge of their own healthcare. With millions of consumers embracing wearables, there is huge potential for flexible electronics technology to have a tremendous impact. In order to advance wearable technology, breakthroughs must be made in flexible electronics manufacturing. There are current technology gaps and challenges associated with flexible electronics, printed electronics, and flexible hybrid electronics that must be bridged with innovative manufacturing.

[1]http://www.statista.com/topics/1556/wearable-technology/

CHALLENGE:

IMPROVING CONDUCTIVITY OF PRINTED ELECTRONIC CIRCUITS AND COMPONENTS

THE CURRENT PROCESSES USED TO PRINT FLEXIBLE CIRCUITS can leave discontinuities and pores from the displacement of the polymer matrix that carries the conducting silver nano-particles. Since the polymer is not completely eliminated, and the silver remains in spherical particles, the resulting silver trace has a much lower conductivity than those produced using traditional circuit manufacturing processes. This currently limits the use of printed electronics to applications that do not require high-speed circuits.

OPPORTUNITY:

Better sintering processes that yield higher conductivity. Potential avenues to explore are more effective laser scanning processes for sintering at high speeds and other material transformation methods suitable for web-based roll-to-roll (R2R) processes.

CHALLENGE:

INTERCONNECTION OF POWER SOURCES TO FLEXIBLE ELECTRONICS

CONNECTING EXTERNAL CIRCUITS AND POWER SOURCES to flexible, flex-printed, and flexible hybrid electronics components presents a major challenge for manufacturers. Traditional joining processes are generally not applicable due to the low melting point of polymeric substrates.

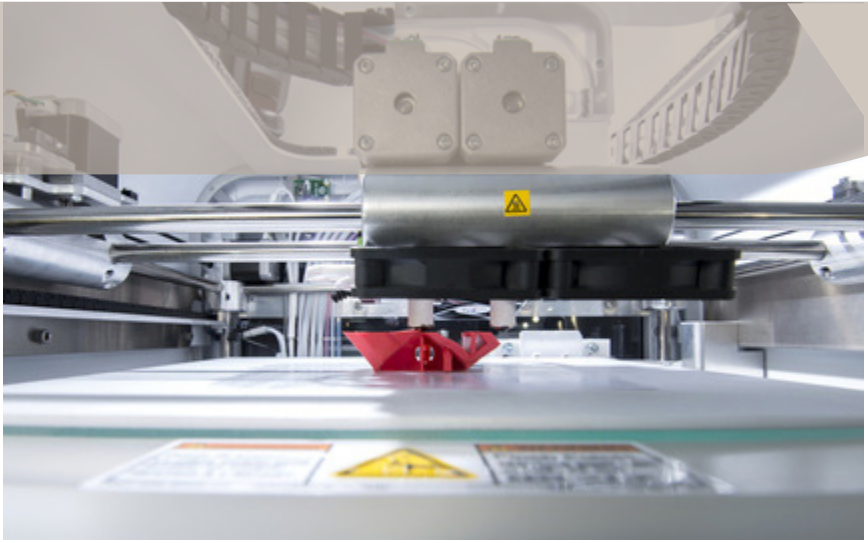
OPPORTUNITY:

Microjoining technologies that are not damaging to sensitive components.

CHALLENGE:

PRINTING HIGHER RESOLUTION, SMALLER, MORE CONDUCTIVE CIRCUITS AND COMPONENTS

TYPICAL PROCESSES LIKE FLEXOGRAPHIC PRINTING yield flexible traces with high resistivity and low conductivity. Smaller, more continuous conductor traces will be necessary to produce the high-resolution printing needed for the small, powerful devices that consumers want.



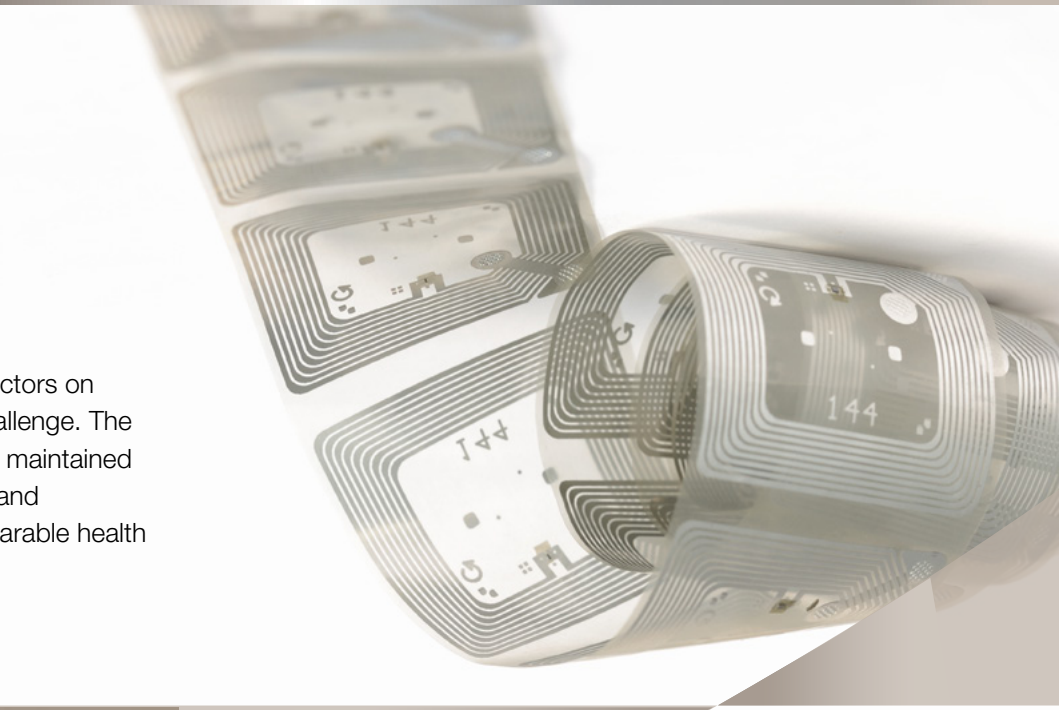
OPPORTUNITY:

Adapt current 3D printing processes to lay down smaller traces that yield higher conductivity.

CHALLENGE:

PRINTING ON FLEXIBLE SUBSTRATES

PRINTING HIGH ASPECT RATIO conductors on flexible, stretchable substrates is a big challenge. The challenge is compounded by the need for maintained performance and durability through wear and washing—something that is critical for wearable health monitoring devices and fitness trackers.



OPPORTUNITY:

Develop novel conductors that stretch with the substrate and yet maintain high conductivity and durability.

CLOSING THE GAP BETWEEN R&D AND COMMERCIALIZATION will require viable solutions to the current challenges and obstacles limiting flexible electronics technology. Developing robust flexible electronics manufacturing processes will require expertise from a wide array of technologies and disciplines. EWI is a leading innovator in materials, micro-scale joining, laser welding, surface finishing, metal forming, dissimilar materials joining, and additive manufacturing. Through investment in unique capabilities and development of breakthrough technologies, EWI implements innovative solutions for electronics manufacturers looking to stay ahead of the competition. For more information, contact **Dale Robinson at drobinson@ewi.org** or **614.688.5232.**

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