

NanoEngineers Print and Test Chemical Sensors on Elastic Waistbands of Underwear

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Daniel Kane

Chemical sensors printed directly on elastic underwear waistbands retained their sensing abilities even after engineers stretched, folded and pulled at the chemical-sensing printable electrodes - sensors that could one day be incorporated into intelligent "hospital-on-a-chip" systems. This work, funded by the U.S. Office of Naval Research, is led by professor Joseph Wang, from the Department of NanoEngineering at the University of California, San Diego Jacobs School of Engineering.

The primary goal of the new peer-reviewed study, published in the journal *Analyst*, was to aggressively test the performance of electrodes printed directly on textiles, something the researchers say has not been done before. The textile of choice - elastic waistbands of underwear - highlights one potential application of the "hospital-on-a-chip" systems the electrodes will be part of: "smart underwear." (Watch a two-minute video in which a UC San Diego undergraduate demonstrates the electrode printing process.)

The "smart" in "smart underwear" refers to the fact that the printed sensors will be incorporated into logic-based biocomputing systems that will monitor biomarkers found in human sweat and tears, make autonomous diagnoses, and administer drugs.

Based on specific combinations of biomarkers such as lactate, oxygen, norepinephrine and glucose, the textile-based smart systems will autonomously diagnose battlefield injuries or changes in patients' health status. According to the diagnosis, the smart system will automatically trigger the release of drugs held in reservoirs, in order to begin treatment before help arrives. All sensors, power, electronics, and logic systems will be embedded in the clothing - such as the elastic waistband of underwear.

"The elastic waistband of common underwear has been selected as model clothing owing to its tight contact and direct exposure with the skin, and hence for its potential for direct sweat monitoring," wrote the authors of the *Analyst* paper entitled, "Thick-film textile-based amperometric sensors and biosensors ". The authors are affiliated with UC San Diego and Chung Yuan Christian University.

Media Contact: Daniel Kane dbkane@ucsd.edu or (858)534-3262

