

Society of Engineering Science 51st Annual Technical Meeting

1–3 October 2014

Purdue University, West Lafayette, Indiana, USA

Processing liquid metal for conformable electronics

Boley, J. William, jwilliamboley@gmail.com; White, Edward L.; Lear, Trevor R.; Chiu, George T.-C.; Kramer, Rebecca K., Purdue University, United States

ABSTRACT

Future generations of robots, electronics, and assistive medical devices will include systems that are soft, elastically deformable, and may adapt their functionality in unstructured environments. This will require soft active materials for power circuits and sensing of deformation and contact pressure. Liquid-embedded elastomer electronics offer one solution as key elements of highly deformable and soft robotic systems. Several designs for stretchable conductors and soft sensory skins (including strain, pressure, and curvature sensors) based on a liquid-embedded-elastomer approach have been developed. Many of these fluid–elastomer composites utilize liquid metal alloys due to their high conductivities and inherent compliance. Understanding how these alloys can be processed for high-yield manufacturability is critical to the development of parallel processing technology, which is needed to create more complex and low-cost systems. This discussion will highlight surface interactions between droplets of gallium–indium alloys and elastomeric substrates, and the implementation of this study to selective patterning, direct-writing, and inkjet printing of hyperelastic electronic components.