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# Evaluation of a Lead Glass for Encapsulating High-temperature Power Modules for Aerospace Application

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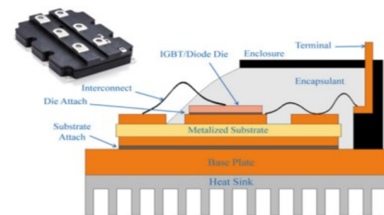
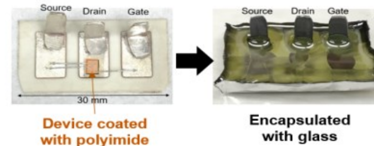
## Abstract

Encapsulation is a big challenge for packaging high-temperature power modules due to limited choices of insulation materials that can be easily processed and have high reliable working temperature of over 250°C. In this work, we evaluated a lead glass as a potential high-temperature encapsulant for protecting SiC power chips interconnected on a common $Al_2O_3$ direct-bond-copper (DBC) substrate. To avoid glass cracking due to its high elastic modulus and mismatched coefficient of thermal expansion (CTE) with that of the DBC substrate, we added a polyimide buffer layer between the glass and the substrate to reduce thermomechanical stresses. We found that the buffer layer was effective in reducing cracks in the glass, but it also lowered the breakdown and partial discharge inception field strengths. Single-chip SiC MOSFET packages were fabricated using the glass encapsulant to demonstrate its feasibility for high-temperature encapsulation.




Schematic of an IGBT power module.




## Biography

*Lanbing Liu is a graduate student working on her PhD degree in Dr. Guo-quan Lu's group in Material Science and Engineering at Virginia Tech. She received her B.S. degree from Material Science and Engineering department of Tianjin University in China in the Fall of 2015. Her current research is on Encapsulation Materials for High-temperature (> 250℃) Power Modules and Additive Manufacturing of Magnetic Components for High Frequency Power Electronics Integration. Lanbing Expects to graduate in 2020.*