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Mechanical and Aerospace Engineering Department
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Analyzing the Thermomechanical Performance of TG400G Material Substrate Core under Immersion Cooling

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**ANALYZING THE THERMOMECHANICAL PERFORMANCE OF TG400G MATERIAL
SUBSTRATE CORE UNDER IMMERSION COOLING**

Abstract

The ever-growing demand for information transfer in consumer electronics and the indispensability of the internet have resulted in a surge in data centres. However, the high energy consumption of traditional data centres, with cooling alone accounting for one-third of the total energy usage, necessitates energy-efficient solutions. Immersion cooling technology has emerged as a promising alternative due to its superior thermal energy management capabilities. However, the impact of immersion cooling on the reliability of IT equipment requires further exploration for widespread implementation.

This study aims to investigate the effects of thermal aging on the thermo-mechanical properties of PCB Substrate, specifically Terragreen 400G, in different fluids. The study subjects the low-loss PCB substrate to thermal aging at different temperatures (85°C and 125°C) and duration (720 hours) in Air, EC100 and PAO6 environments. The complex modulus and Glass Transition Temperature (T_g) are analysed before and after aging to assess any changes in material properties.

The results of this research will contribute valuable insights into the reliability and applicability of Terragreen 400G PCBs in immersion cooling scenarios, advancing the quest for energy-efficient and environmentally conscious data centres. Additionally, the findings will enrich the understanding of electronics mechanical design by shedding light on material behaviour under thermal aging conditions.