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Nano-porous Silica-based Aerogel Films for Microsystems Insulation

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Abstract

This project will model, demonstrate, and develop fabrication recipes for emerging dielectric materials to manage thermal performance in microelectronic systems. Such materials, specifically those featuring nano porous silica-based morphologies, have received significant attention in recent years due to their low dielectric constant (k). However, their inherently low thermal conductivity has not been studied in the context of thermal management at the device level. Among the target applications are: 1) an infrared focal plane array (IRFPA) and 2) a micro-miniature oven controlled crystal oscillator (OCXO).

Low-cost, CMOS-compatible, low conductivity materials could significantly improve performance while reducing the power requirement of each application. The program will be divided into two main tasks: 1) material characterization and process development and 2) system modeling and correlations. It is designed to demonstrate the feasibility of aerogel as thermal insulation in CMOS microsystems and apply the work to specific applications, of interest to our PA industrial partner, through system modeling.