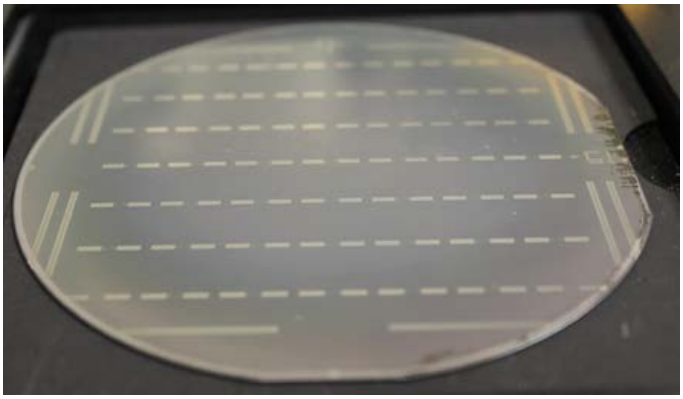
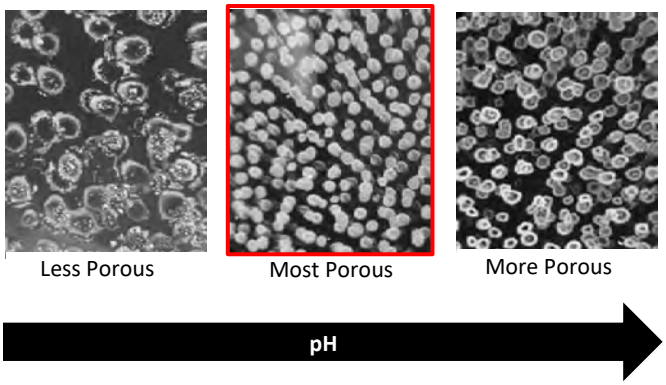
Improved Method of Aerogel Thin / Thick Film Preparation

Although aerogel was discovered years ago, prized for both its low density and thermal conductivity, attempts of fabricating aerogel as thin films or thick films are hampered by technical limitations including low porosity, cracking, and roughness of the resulting film. The complexity of aerogel film processing stems from the high stress and shrinkage induced during the film drying steps. Employment of supercritical drying and/or solvent extraction methods yield some success, but produce no more than a couple of microns thick film and introduce additional processing steps. And for thicker films (4-50 uM), there has been no breakthrough to yield a quality aerogel film. Today, the processing of aerogel is generally considered technically limiting by both academic and industry experts. In this current invention, researchers at the University of Louisiana at Lafayette have developed a novel technique that utilizes a pH-optimized ethanol aspirator process for aerogel processing that resolves the aforementioned limitations of thin/thick films manufacturing without incorporating any additional processing steps such as solvent exchange and/or supercritical drying. The initial motivation of this development was to replace the high cost of micromachined air gaps in silicon wafers with silica aerogel as a super heat insulating material for metal oxide sensors. However, the novelty of this invention applies broadly to thin/thick film processing of aerogel and other sol-gel processes.

Multilayer (4uM think) Aerogel on 4" Wafer



Optimized Alcogel pH Increases Resulting Aerogel Porosity



KEY ASPECTS OF THE TECHNOLOGY:

- Eliminates supercritical drying;
- Does not require solvent extraction;
- Film dries during application to the surfaces;
- Wide range of thickness is achievable from 50 nm to 50 micron;
- Variety of deposition methods like spin coat, spray, and direct write are possible;
- Applications in IC and 3D-IC;
- Based on patent-pending technology.

UL Lafayette specializes in Research for a Reason. We recognize that the current technology may by brought into practical use for public benefit and yield economic value. Accordingly, we currently seek a commercial partner interested in commercial development of this technology via licensing and/or collaborative research partnerships. To learn more about this research and/or partnership opportunities please the Office of Innovation Management, via the info provided below.

Office of Innovation Management

University of Louisiana at Lafayette · 537 Cajundome Blvd. Ste. 115 · Lafayette, LA 70506

Tel: 337-735-5483 · OIM@louisiana.edu

Improved Method of Aerogel Thin / Thick Film Preparation (Conti.)

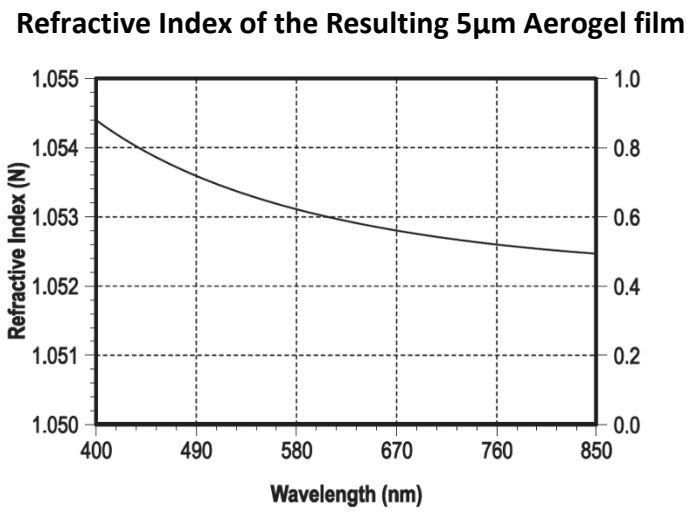
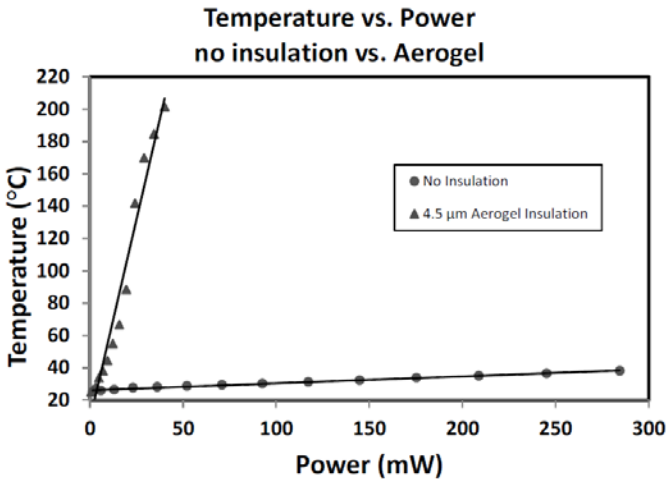


FIG. 6



Related Publications:

Kumar, Seyedjalali and Madani. MOX Gas Sensors Using Multilayer Aerogel. IEEE 2013

Seyedjalali, Kumar and Madani. Ultra-dense and ultra-low power microhotplates using silica aerogel. IET 2013.

US20150201463A1. ULTRA DENSE AND ULTRA LOW POWER MICROHOTPLATES USING SILICA AEROGEL AND METHOD OF MAKING THE SAME. USPTO.

Office of Innovation Management

University of Louisiana at Lafayette · 537 Cajundome Blvd. Ste. 115 · Lafayette, LA 70506

Tel: 337-735-5483 · OIM@louisiana.edu