

Title: SBIR Phase II: Micromachined Vacuum Microelectronic Devices Using Nanoscale Self-Assembly

Award Number: 9983511
Program Manager: Winslow L. Sargeant

Start Date: June 1, 2000
Expires: May 31, 2002
Total Amount: \$400,000
Investigator: Dmitri Routkevitch, droukevitch@synkera.com
Company: Nanomaterials Research LLC
1831 Left Hand Circle
Longmont, CO 80501
Phone: (720)652-4001

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop a novel low-cost microfabrication technology for vacuum microelectronics. Affordable and reliable microfabrication of refractory materials is needed, since these materials are able to withstand high temperature and severe electromagnetic radiation. Although several materials have been identified as candidates, they have both high cost and difficulties with high aspect ratio, high resolution bulk micromachining. An approach based on self-organized nanoporous anodic alumina with unique anisotropy morphology will allow high aspect ratio, high resolution micromachining. Phase I demonstrated that a vacuum microtriode with promising performance could be fabricated from micromachined alumina ceramic. This may be the only technology for making ceramic micro-electromechanical systems (MEMS) for vacuum microelectronics and other applications, that are stable in harsh environments, have mechanical durability, are compatible with mainstream microfabrication, cost less, and scale up suitably. Phase II will optimize the technology and design, fabricate prototypes of vacuum integrated circuits (logic and amplifier), and scale-up the processes of device batch production for evaluation.

Potential commercial applications include vacuum microelectronics and MEMS for the harsh environments of space, satellite communications, radars, deep drilling, nuclear reactors, as well as less strenuous environments that attend such uses as cellular phone networks, flat panel displays, and various sensors