Abstract for the March Meeting of the American Physical Society
Indianapolis, IN March 2002

Analysis of Focused Ion Beam Trenches in Si for Nanofluidics Applications

A. P. Baddorf and G. W. Ownby
Oak Ridge National Laboratory
A. B. Hmelo and R. A. Weller
Vanderbilt University

An essential component in nanofluidic studies is the fabrication and characterization of channels with nanoscale cross-sectional dimensions. We have used focused ion beam technology to mill channels with widths 50–500 nm in single crystal Si, which can be bonded with glass to form an enclosed fluid channel. Milled channels were examined using AFM, SEM, and energy dispersive X-ray (EDX) analysis. Important attributes for fluid flow where measured, including cross section, uniformity, and roughness. Typical defects observed include angled walls, constrictions, nonuniform channel bases, and particle obstructions. In agreement with previous reports, [1] EDX indicates several percent implanted Ga (used in the milling) and C in and adjacent to the channels. New in this study is the observation of mounds at edge of the channels, with typical heights of 10–40 nm, which scale with the channel dimensions. This swelling could originate from Ga implantation, but is more likely due to amorphization of the Si walls. Such features could make sealing for fluid studies more difficult.

Sponsored by the LDRD program of ORNL, managed by UT-Battelle, LLC, for the U.S. DOE under contract number DE-AC05-00OR22725.

[1] Y. K. Park et al., Nucl. Instr. Methods Phys. Res. B 136-138 (1998) 373.

"The submitted manuscript has been authored by a contractor of the U.S. Government under contract No. DE-AC05-00OR22725. Accordingly, the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or allow others to do so, for U.S. Government purposes."