Abstract submitted to
Symposium I: Wafer Bonding and Thinning Techniques for Materials Integration
for the Spring 2001 Meeting of the Materials Research Society
to be held April 16-20, 2001, San Francisco, CA

CRYSTAL ION SLICING OF DOMAIN MICROENGINEERED ELECTRO-OPTIC DEVICES ON LITHIUM NIOBATE.

David A. Scrymgeour and V. Gopalan, Materials Research Laboratory , Pennsylvania State University, University Park, PA.
Tony E. Haynes, Solid State Division, Oak Ridge National Laboratory, Oak Ridge, TN
Miguel Levy, Physics Department, Michigan Technological University,Houghton, MI.

The ability to control the angular position of a laser beam with high speed is of interest in many applications including optical communications, optical data storage, laser printing, and display technologies. Active solid-state electro-optic scanners based on micro-patterned $LiNbO_3$ and $LiTaO_3$ have several advantages over mechanical and other systems including small device size and high operating speed (intrinsic response frequencies >100GHz). However, widespread application of these devices is currently limited because of the large voltage required to operate devices fabricated in single crystals. A solution to this problem is to make the devices thinner. By crystal ion-slicing of domain-engineered devices fabricated on wafers, operating voltages can be significantly reduced. We report successful fabrication of 4-10 micron thick domain microengineered $LiNbO_3$ device films prepared by a combination of He-ion implantation and chemical etching. A systematic study of the processing conditions for the slicing reveals that the key parameters for successful slicing are implantation energy, temperature and time of pre lift-off anneal, and liftoff chemistry of the etchant. The surface of the sliced crystal shows crystallographic etch lines which are minimized with pre-annealing and by reducing etching time by optimizing the etchant solution. The effects of the lift-off process on pre-existing domain structures, and the scanning performance of a resulting sliced electro-optic scanner device, currently being tested, will be presented.

Presenting & Contact Author:
David A. Scrymgeour MRS id: 98650
Pennsylvania State Univ
Materials Research Lab
MRL
Room 141
University Park PA 16803
Phone:
Email: das251@psu.edu

Oak Ridge National Laboratory, managed by UT-Battelle, LLC, for the U.S. Dept. of Energy under contract DE-AC05-00OR22725.