Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Propagation properties and mass sensitivity of SAW on an AlN/a-plane Sapphire structure JIANZENG XU, QIANGHUA WANG, GUOPENG HU, HAO YING, GREGORY W. AUNER, WAYNE STATE UNIVERISTY TEAM — AlN thin films were grown on a-plane sapphire substrates by a plasma enhanced RF sputtering system. The x-ray diffraction (XRD) and reflection high energy electron diffraction (RHEED) techniques were combined studied the structural properties of the films. It is found that high quality (0001)AlN was epitaxially grown on a-plane sapphire. SAW delayline devices operating from 170 MHz up to 1 GHz were fabricated with propagation direction varying in a 15 deg. interval. Besides the excitation of Rayleigh typed SAW (R-SAW) mode at all angles, a shear-horizontal (SH) mode also emerged from the system at particular propagation directions. The measured phase velocities of the SH waves are 6091-6119 m/s, which is very close to the slow shear velocity of a-plane sapphire at about 6100 m/s. This SH mode is most likely the pseudosurface wave with a leaky nature into the sapphire substrate. The phase velocity dispersion with respect to the relative AlN film thickness and azimuth angle is presented. The device electro-mechanical coupling constant was determined to be 0.001-0.003 by the impedance measurements. Mass sensitivity of the two modes was studied by the deposition of highly elastic polymeric overlayers. The measured mass sensitivity is 95 Hz/ng cm-2 and 82 Hz/ng cm-2 for the R-SAW and SH-SAW, respectively.

Jianzeng Xu
ECE Department, Wayne State University

Date submitted: 01 Dec 2004 Electronic form version 1.4