Abstracts

Investigations on plasma-polymer-coated SAW and STW resonators for chemical gas-sensing applications

I.D. Avramov, S. Kurosawa, M. Rapp, P. Krawczak and E.I. Radeva. "Investigations on plasma-polymer-coated SAW and STW resonators for chemical gas-sensing applications." 2001 Transactions on Microwave Theory and Techniques 49.4 (Apr. 2001, Part II [T-MTT] (Special Issue on Microwave Acoustic Wave Devices for Wireless Communications and Sensing)): 827-837.

Results from gas probing with various analyte vapors on high-Q low-loss surface transverse wave (STW) and surface acoustic wave (SAW) resonators coated with thin plasma-polymer films of hexamethyldisiloxane (HMDSO), styrene, and allyl alcohol at different polymerization conditions are presented in this paper. At the same acoustic wavelength of 7.22 /spl mu/m and identical film thicknesses, HMDSO-coated STW devices feature substantially higher relative sensitivities to all analytes compared to their SAW counterparts. When operated in a microwave oscillator loop, plasma-poly-styrene and allyl-alcohol-coated STW devices generate strong sensor signals, even at low analyte concentrations, retaining an oscillator short-term stability in the 1/spl times/10/sup -9//s to 1/spl times/10/sup -8//s range. A 250 kHz sensor signal with 7/spl times/10/sup -9//s stability was obtained from a styrene coated 700 MHz STW resonator oscillator at a 1400 parts per million concentration of xylene vapor, which results in a measurement resolution of less than 40 parts per billion for xylene in the ambient air. It is shown that, with respect to sensitivity and stability over long probing periods, plasma-polymer films may become a serious competitor to the more or less unstable soft polymer coatings currently used in SAW-based gas sensors for applications in wireless systems for environmental control and protection.

❑ Return to main document.