Abstracts

The application of dielectric thin films to enhance the properties of SAW devices

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To meet the increasing demands of personal and commercial communication systems, high performance SAW devices are required to have high frequencies, low loss, wide bandwidth, and high reliability. It was determined early in the investigation of SAWs that there were velocity, loss, coupling factor, and temperature coefficient improvements to be gained through the use of thin amorphous dielectric films on piezoelectric substrates. While this kind of film technology has been used sparingly in SAW device product development, it still represents a potential source for enhancing such products. Deposited on a bare piezoelectric wafer, amorphous films provide the functions of surface passivation, reduction of pyroelectric effects, and smoothing to reduce SAW propagation loss. Films modify the coupling factor, reduce the temperature coefficient of frequency, and permit higher order SAW modes to be propagated. As a practical manufacturing matter, thin films on electroded SAW components provide a protective coating to prevent shorting by metal particles, reduce metal migration due to electric and stress fields, protect from degradation due to chemicals and corrosive vapors, and be used very effectively for frequency trimming. For pseudo-SAW propagation on rotated substrates, the dielectric film can reduce the leaky-wave losses and enhance coupling factor and TCF. This paper considers the advantages of nitride and oxide films on piezo-substrates for the enhancement of SAW devices.

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