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Dependence of preferred c-axis orientation on RF magnetron sputtering power for AZO/Si acoustic wave devices (Conference Paper)

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Abstract

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We report the deposition of high quality c-axis oriented Aluminium doped Zinc Oxide (AZO) on silicon substrate for surface acoustic wave (SAW) applications. AZO thin film is prepared by Radio frequency magnetron sputtering method. Sputtering is a preferred method because it is able to perform deposition at low temperature, produce uniform thin film and possesses high deposition rates. In preserving the functionality of the device during post CMOS process, low deposition temperature is crucial. In order to obtain the preferred AZO structural properties with strong acoustoelectric interaction, we investigate the influence of RF power on c-axis preferred orientation of AZO/Si multilayer. The deposited thin films are characterized by X-Ray diffractometer and scanning electron microscopy (SEM). The crystal structures are evaluated in terms of c-axis lattice constant, d-spacing and crystallite size. It is observed that as RF power increases, the AZO film is predominantly oriented at c-axis (002) and achieved high crystalline quality. However, if the applied RF power is too high, the energized ions would impede the growth of high quality film. The optimum RF power was found to be at 250 W, at which the material exhibits hexagonal wurtzite-type lattice of ZnO structure, high crystallinity (lowest FWHM value) and crystallite size, and high deposition rate. © 2015 IEEE.

Author keywords

Al doped ZnO c-axis orientation RF power sputtering substrate heating

Indexed keywords

Engineering controlled terms: Acoustic surface wave devices Acoustic waves Chip scale packages CMOS integrated circuits Crystallite size Deposition rates Film growth Film preparation Magnetron sputtering Scanning electron microscopy Sputtering Temperature Thin films Zinc oxide Zinc sulfide

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Al-doped ZnO

C-axis orientations

C-axis-preferred orientation

Low deposition temperature

Radio frequency magnetron sputtering method

Rf-power

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