

Amorphous SiC/c-ZnO-based Lamb mode sensor for liquid environments

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Abstract : The propagation of the first symmetric Lamb mode S_0 along ZnO/a-SiC thin composite plates was modeled and analysed aimed at the design of a sensor able to detect the changes of the environmental parameters, such as added mass in vacuum and the liquid viscosity changes in a viscous liquid medium. The Lamb mode propagation was modeled by numerically solving the system of coupled electro-mechanical field equations in the two media. The S_0 acoustic field profile was calculated aimed at finding the proper plate thickness suitable for the propagation of longitudinally polarized modes. The phase velocity and electroacoustic coupling efficiency dispersion curves of the S_0 mode were calculated aimed at the design of enhanced coupling efficiency devices. The gravimetric sensitivity in vacuum, and the attenuation that the S_0 mode suffers when contacting a liquid viscous Newtonian environment were finally calculated for different ZnO layer thicknesses. Recently obtained results on the sputtering deposition of the a-SiC and ZnO thin and thick layers on Si substrates are also reported.

Keywords : Lamb S_0 mode, Amorphous SiC-ZnO, sensors, viscous liquids