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POS-F45 – Optimizing ZnO overlayer for surface acoustic wave devices

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A piezoelectric substrate is key for generating surface acoustic waves. The high electromechanical coupling factor of Zinc Oxide (ZnO) makes it a suitable material for this purpose. Among various techniques, we use physical vapour deposition (PVD) to obtain a uniform and well-orientated film. In this study, we used both RF and DC sputtering with a ZnO source and compare the quality of the resulted film. For both of the methods, we vary several parameters and repeat the deposition process to study the impact on the quality of the deposited film. The parameters we studied included the substrate temperature, pressure of the deposition chamber, as well as the types and ratio of the gases involved in the sputtering process. To quantify the film quality, we use x-ray diffraction and evaluate the orientation of the c-axis. We additionally measure the film thickness with a profilometer to study and estimate the growth rate. As the final step of characterization, a pair of Aluminium interdigitated transducers are fabricated on the surface of ZnO to confirm the propagation of the surface acoustic waves through the medium. This was done by measuring the frequency response of the transducers by a network analyzer. Through our three steps characterization, we find the best parameter configuration that can lead to a high-quality film for surface acoustic wave devices.

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