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# Ion Beam Trimming of Compound Wafer

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Modern applications of micro- and nano-electronic devices require complex multilayered structures of various crystalline (semi-)conducting, piezoelectric or isolating materials. In certain occasions, it has turned out useful to create these layers not by means of deposition but rather by composing the layer stack from pre-manufactured wafers of the required materials. Well known since years are silicon on insulator (SOI) wafers, while new compound wafers like lithium niobate (LN) or lithium tantalate (LT) on silicon are recently upcoming new combinations. Both find increasing interest for the manufacturing of micro electro-mechanical systems (MEMS) devices. The LN/LT-compound wafer re-gained industrial interest in the field of telecommunication filtering because of the steady growing demand for bandwidth utilization of mobile communication devices. The layered wafer structure gives high Q factors, due to its intrinsic better confinement of the acoustic wave, challenging the aluminum nitride (AlN) film bulk acoustic resonator (FBAR) filters. In addition, the underlying $SiO_2$ layer can control the temperature coefficient of frequency (TCF). In all cases, the layer thickness influences directly the resonance frequency of the device, and the layer uniformity results in higher yield, higher quality, and reduced manufacturing costs. Either smart cutting or bonding, subsequent grinding and final chemical mechanical polishing (CMP) sets the thickness of the final top "device" layer. However, oftentimes the specification for the layer thickness homogeneity becomes stricter than those methods can deliver. In these cases, ion beam trimming of the top layer drastically improves both, the thickness uniformity (and thus subsequent device yield) as well as the desired target thickness accuracy. By means of the applied trimming technique, the functional layer thickness can be adjusted down to < +/□2 nm off the target value for all the investigated materials. The standard deviation of the thickness topology error decreased significantly with typical improvement factors of 20 to 50, depending on the incoming quality, respectively.

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