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Laser slicing of silicon wafers ONUR TOKEL, AHMET TURNALI, Bilkent University, TAHIR COLAKOGLU, Middle East Technical University, IHOR PAVLOV, Bilkent University, MONA ZOLFAGHARI BORRA, Middle East Technical University, GHAITH MAKEY, Bilkent University, ALPAN BEK, RAIT TURAN, Middle East Technical University, FATIH OMER ILDAY, Bilkent University — Functional electrical, MEMS and solar-cell devices are fabricated on silicon through the highly successful and established lithography techniques. However, these methods are geared towards processing from surface, are expensive, require masks, and in many cases involve multi-step procedures. Here, we present a new laser-slicing method for creating thin-sliced (30 um) Si chips, which constitutes the first time Si wafers are sliced with lasers. We first exploit nonlinear interactions of a focused laser in creating 1um-wide, wall-like structures fabricated in Si. These subsurface structures are then selectively etched to demonstrate a plethora of functional elements and 3D architectures inside Si [1]. In particular, we demonstrate the first laser-carved through-Si vias for intra-chip interconnects, laser-sculpted high-aspect-ratio micropillar arrays and thin-wafers for solar-cell applications, and micro-cantilevers for MEMS and biomedicine. This new method complements available techniques by taking advantage of the bulk of Si in 3D, and can pave the way towards entirely new multilevel and multifunctional solar-cell and MEMS devices. [1] Tokel et. al. Laser-driven self-organised functional 3D superstructures deep inside silicon, Nature (under review).

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