A New Process for Implantable Silicon-Glass Microsystems

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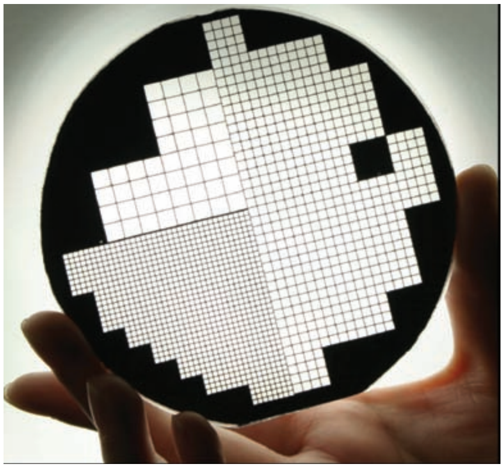

Figure 1 – A 100mm glass-in-silicon wafer with silicon feedthroughs.

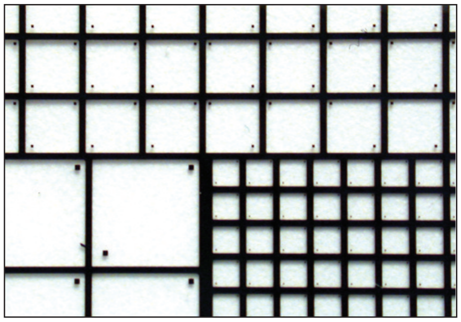

Figure 2 – The smallest die shown in the close-up are 1mm x 1mm in size.

A new process has been developed for fabricating silicon-glass microsystems such as the implantable intraocular pressure sensor now being pursued by the WIMS ERC. The process allows the realization of glass die of arbitrary two-dimensional shape containing silicon (or metal) feedthroughs as small as 20μm in diameter. Shaping glass and producing feedthroughs in it are both long-standing problems in MEMS. This process overcomes them by recessing a silicon wafer to a depth equal to the final glass thickness desired using a deep dry etch. With the silicon recessed, a glass wafer is anodically bonded to it and then heated above its transition temperature. The glass flows into and fills the silicon cavities. After cooling, the wafer is planarized using lapping followed by a chemical-mechanical polish to form a glass-in-silicon wafer (see Figure 1). The wafer can be anodically bonded to a second wafer containing, for example, silicon regions defined by a boron etch-stop. A final anisotropic silicon etch then performs die separation, producing completed devices (see Figure 2). ■