"Direct-Write Laser Micropatterning Techniques for Polymer Circuits, MEMS Interconnects and Ceramic Thick-Film Devices"

MicroConnex, Inc.
34935 SE Douglas St., Suite 200
Snoqualmie, WA 34935
Phone: 425-396-5707
Fax: 425-396-5861
www.microconnex.com

Electro Scientific Industries, Inc.
13900 NW Science Park Drive
Portland, OR 97229
Phone: 503-641-4141
Fax: 503-643-4873
www.esi.com

Authors: Scott Corbett, Jeff Strole (MicroConnex), Edward Swenson, Wilson Lu (Electro Scientific Industries)

Abstract: In this poster we present a variety of novel fabrication methods using UV laser direct-write technology, including direct-write lithography and ablation among other techniques. Using a UV laser processing system (Electro Scientific Industries, 5330) we have exposed both negative and positive photoresists to form etch masks for fine-line patterning of polymer flex circuits, used direct-write ablation to directly remove metal from polymer circuits, exposed thick film photosensitive ink for ceramic circuit fabrication and directly ablated unfired and fired thick-film inks on ceramic. With attenuated output, the laser can be used to directly expose photodefinable materials used in a variety of circuit processing industries. Using negative acting resists or epoxies, the laser cross-links the photosensitive polymer enabling an additive process. At higher fluence, the laser directly ablates or removes material, supporting subtractive micromachining of photo or non-photosensitive materials. We have explored a variety of laser beam profiles including Gaussian as well as flattened and round and square apodized beams to enhance the direct-write process. Direct-write technologies allow fine structure patterning (additive or subtractive) without requiring expensive photomasks and aligners. The technique eliminates several process steps, enables direct transfer of "virtual" software files to direct physical structures and allows rescaling of patterns for precise alignment to fiducial patterns. Direct write techniques can be selectively combined with conventional mask lithography methods to enhance resolution and precision of patterning in critical areas. We present circuits and devices we have fabricated for a variety of applications including medical implants, electronic interconnects for chip scale packaging and ceramic hybrid circuits.