



New 3D MALDI Plates composed of layered, photo-etched, stainless steel, sheets.

Poster Number MP 571

Joe Fitzpatrick; Stephen Hattan; Kevin Hayden; Roger Voyer; Marvin Vestal

Virgin Instruments, Sudbury, MA

INTRODUCTION:

- New family of 3 dimensional (3D) MALDI plates developed to efficiently couple LC and Gel separations to MALDI mass spectrometry
- Photo-etch fabricating allows for inexpensive, *precise* plate construction
- Variable plate geometries used to match requirements of the application
 - LC flow rates 1 μ L/min to 1mL/min
 - high density plate allows for spatial resolution of 1mm
 - small pore size on MS analytical surface does not deteriorate resolution

PLATE CONSTRUCTION AND GEOMETRIES:

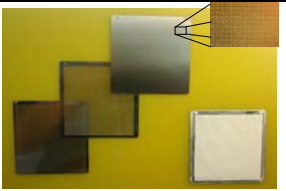


Photo etching technology

- provides low cost alternative to machining
- offer excellent precision and tolerance $\pm 15\%$ material thickness from 0.05-1.5mm
- limitations in thickness of material that can be accurately etched plate construction done by assembling multiple layers

Geometry

- different patterns used to create plate geometries with a required characteristics

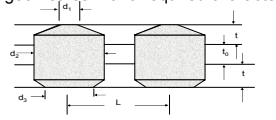
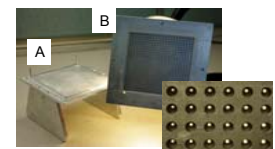
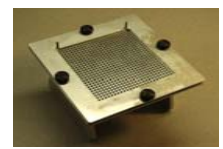


Plate	Array	L	d1	d2	d3	No.*	t	t0	V/hole (μ L)
LC Standard	27 x 25	4	0.05	3	2.5	2	1.5	n/a	20
LC High	27 x 25	4	0.05	3	2.5	8	1.5	1.5	80
LC Low	50 x 50	2	0.05	1.5	1.2	2	1.5	n/a	5
Image	100 x 100	1	0.025	0.8	0.6	4	0.75	0.75	1.5

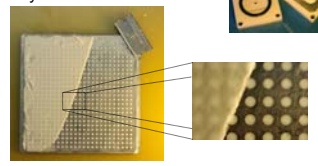
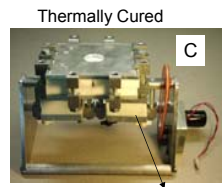
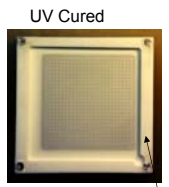
PLATE ASSEMBLY:



- Stainless steel layer bonded together using cyano-acrylate adhesive
- Designed Jig (A) and frame allow for proper alignment of the layers and removable frame (B) allows through-holes to be cleaned if necessary

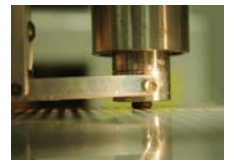
SAMPLE CAPTURE MEDIA:

- Individual holes in the CHS plates are filled with polymeric type monolithic chromatography resin
- Polymers are made by either UV or thermal initiation
 - methacrylate based -UV
 - styrene based -thermal
- All reaction take place in teflon molds
- Rotisserie device (C) designed to minimize density and thermal gradients in polymer during plate construction
- Excess polymer removed with a razor until coincident with metal surface of plate
- Styrene/Divinylbenzene, Butylmethacrylate and Stearyl methacrylate plates have been constructed for protein and peptide capture
- Recipes generally consist of 40% monomer and 60% porogen



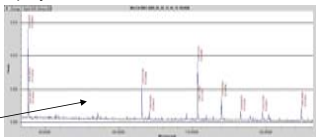
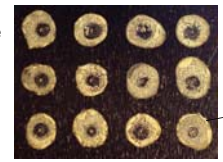
LIQUID CHROMATOGRAPHY INTERFACE

- Provides x-y positioning of deposition on the plate
- Allows sample position on the plate to be correlated with laser position in the mass spectrometer to within 10 μ m.
- Solenoid lift provides z-axis motion when traveling from spot to spot.
- LC column is coupled to the interface via PEEK tubing
- O-ring seal is used to channel effluent through individual holes preventing cross-contamination



MS ANALYSIS

- 50 μ m holes diameter allow sample and matrix to elute and dry on stainless steel surface so MS analysis does not occur on non-conductive polymer
- Signal resolution is not compromise



Capture and Elution of BSA Std

Funding:

This work was supported by National Institute of Health SBIR Grant GM079833