

New Fabrication Techniques for PASS



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Outline of Talk:



1. Introduction to SSGD and PASS.
2. Previous fabrication technique.
3. New fabrication techniques:
 1. i. Large scale photolithography;
 2. ii. Embossed surfaces with fine cutting tool;
 3. iii. Structured surfaces.

PASS - SSGD



The planar array of of superheated superconducting superheated superconductors (**PASS**) is a type granule detector (**SSGD**). Original SSGDs were “colloidal” – a suspension of microspheres in a suitable medium (e.g. epoxy, wax).

Original fabrication procedure for PASS:

1. Deposit thin film of Type I superconductor on to a substrate (indium/mylar, tin/kapton).
2. Fabricate square lattice of squares (or other geometries) by photolithography.
3. Melt in presence of “wetting agent” to produce array of microspheres.



ATTRIBUTES AND FAILINGS OF PASS

UBC group has demonstrated that the PASS detector:

- Has good energy sensitivity
[G. Meagher et al., J. Low Temp. Phys. 93 (1993) 461];
- Has position sensitivity
[G. Meagher et al., Nucl. Instr. Meth. A348 (1994) 696];
- Can detect neutrons
[G. Meagher et al., Nucl. Instr. Meth. A370 (1996) 8];
- Can support a partial avalanche in a line of granules
[G. Meagher et al., LTD7 (1997) p 191];

Bad news is that we can't make it large enough.



New Fabrication methods for PASS

1. Improved photolithography (IMEC, Leuven)

Large scale photolithography on Si wafers.

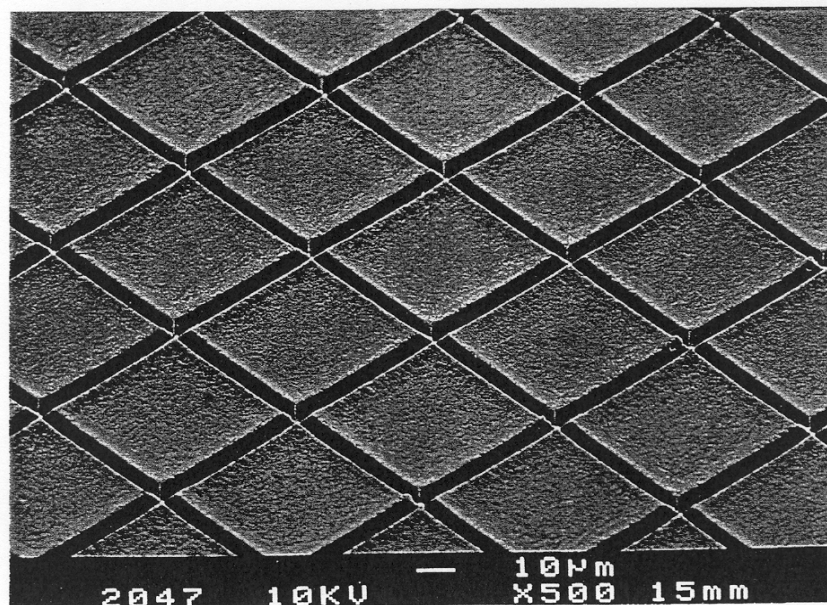
2. Cutting film with tool (3M)

- (i) Emboss thin film sample with very precise and sharp cutting tool to make squares.
- (ii) Then do wetting and melting procedure.

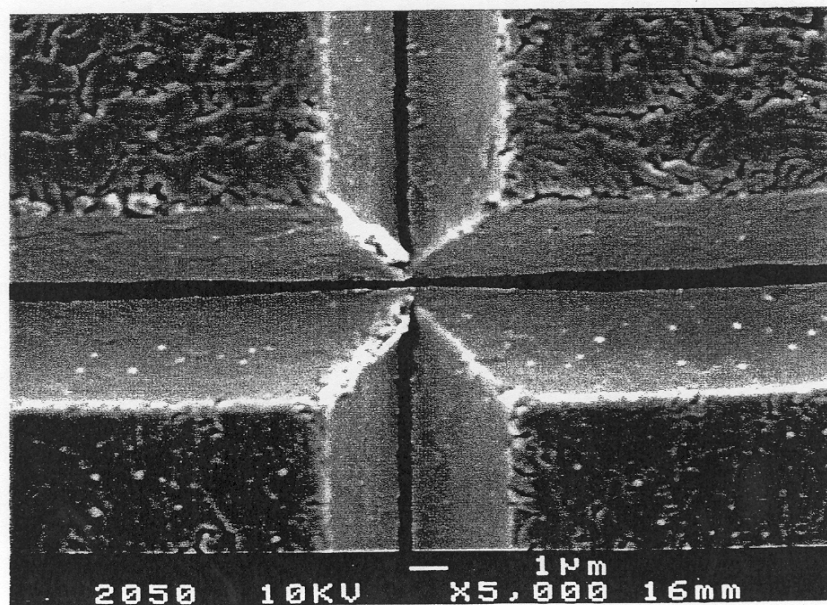
3. Using “structured surface” (3M)

Produce structured surface, e.g. hollows in a plane. Cover with metal (e.g. indium, tin). Then wet and melt.

(a.)

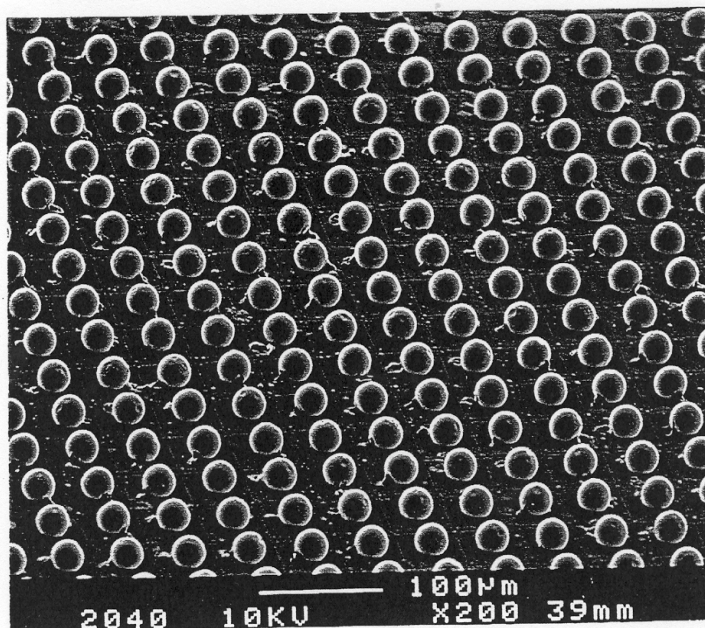


(b.)

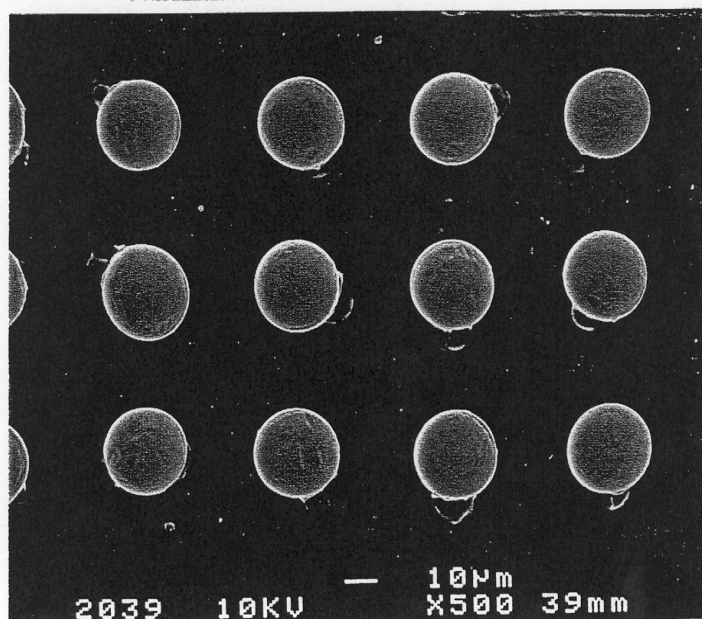


(a) Embossed surface showing cuts by 3M tool into the tin film prior to melting. (b) Magnified view.

(a.)



(b.)



3M sample after melting. (a) Scale 100 μm . (b) scale 10 μm .

Hysteresis curve showing superheating and supercooling of 3M PASS sample.

