

# Melt infiltrated/textured YBCO bulks with artificially patterned holes

**S. Meslin<sup>a</sup>, C. Harnois<sup>a</sup>, D. Chateigner<sup>a</sup>, X.  
Chaud<sup>b</sup> and J.G. Noudem<sup>a</sup>**

**<sup>a</sup>Laboratory of Crystallography and Materials Sciences  
CRISMAT-ENSICAEN, CNRS UMR 6508, Caen - France**

**<sup>b</sup>CRETA/CNRS, Grenoble - France**

# Aim

- **facilitate the sample oxygenation and decrease the crack number in the ab planes**
- **decrease the number of voids and pores in large samples**
- **simplify the sample shaping for fault current limiters**
- **improve the sample cooling during applications, avoiding hot spots**

# State of the art

- **Preparation of regular arrays of antidots in Y123 thin films and observation of vortex lattice matching effects**

**A. Castellanos, P. Selders, M. Vaupel, R. Wördenweber, G. Ockenfuss, A. v.d. Hart and K. Keck : EUCAS (1997) the Netherlands**

- **Superconducting foam**

**R.E. Suddakar and G.J. Schmitz SST 15(2002) L21**

- **Growth of single domains through sintered YBaCuO pellets drilled with an array of holes for the fabrication of c-axis superconducting elements for current limitation application**

**R. Tournier, X. Chaud, D. Isfort, L. Porcar, G. Kapelski : Pasreg-2003 Jena (Germany)**

# Samples preparation

## Composition :

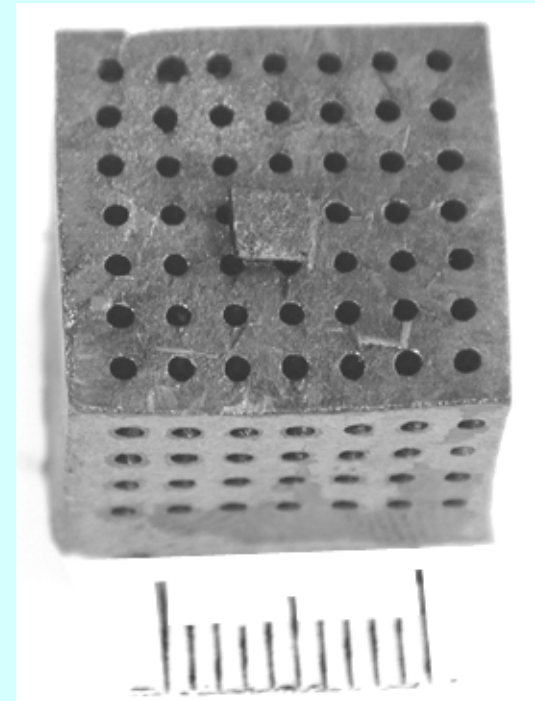
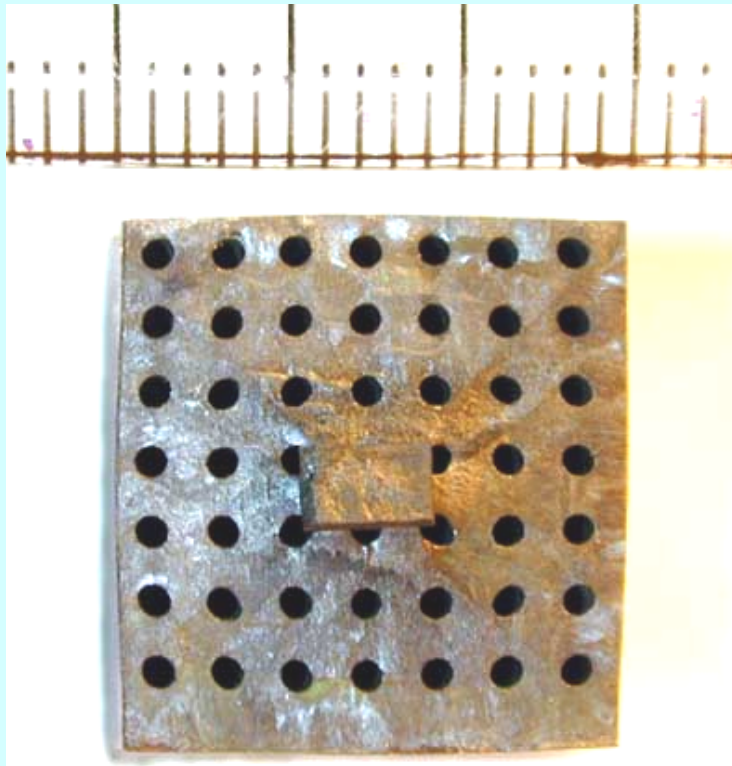
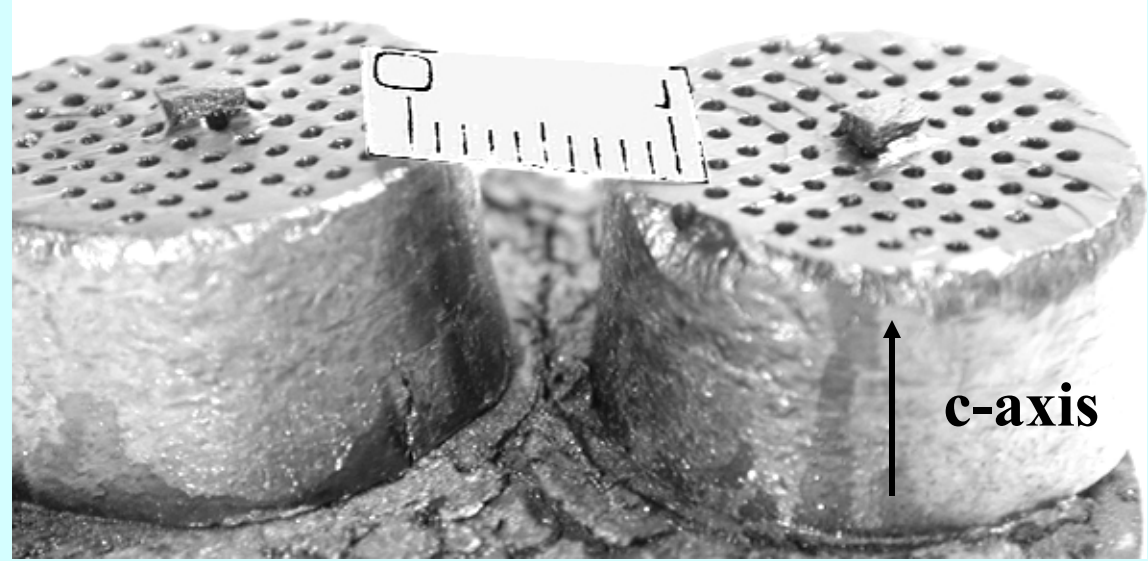
**TSMG** : Y123 + Y211 (25 mol %) +  $\text{CeO}_2 + \text{SnO}_2$

**IG** : (Y035+x%Y123) / Y211+  ~~$\text{CeO}_2 + \text{SnO}_2$~~

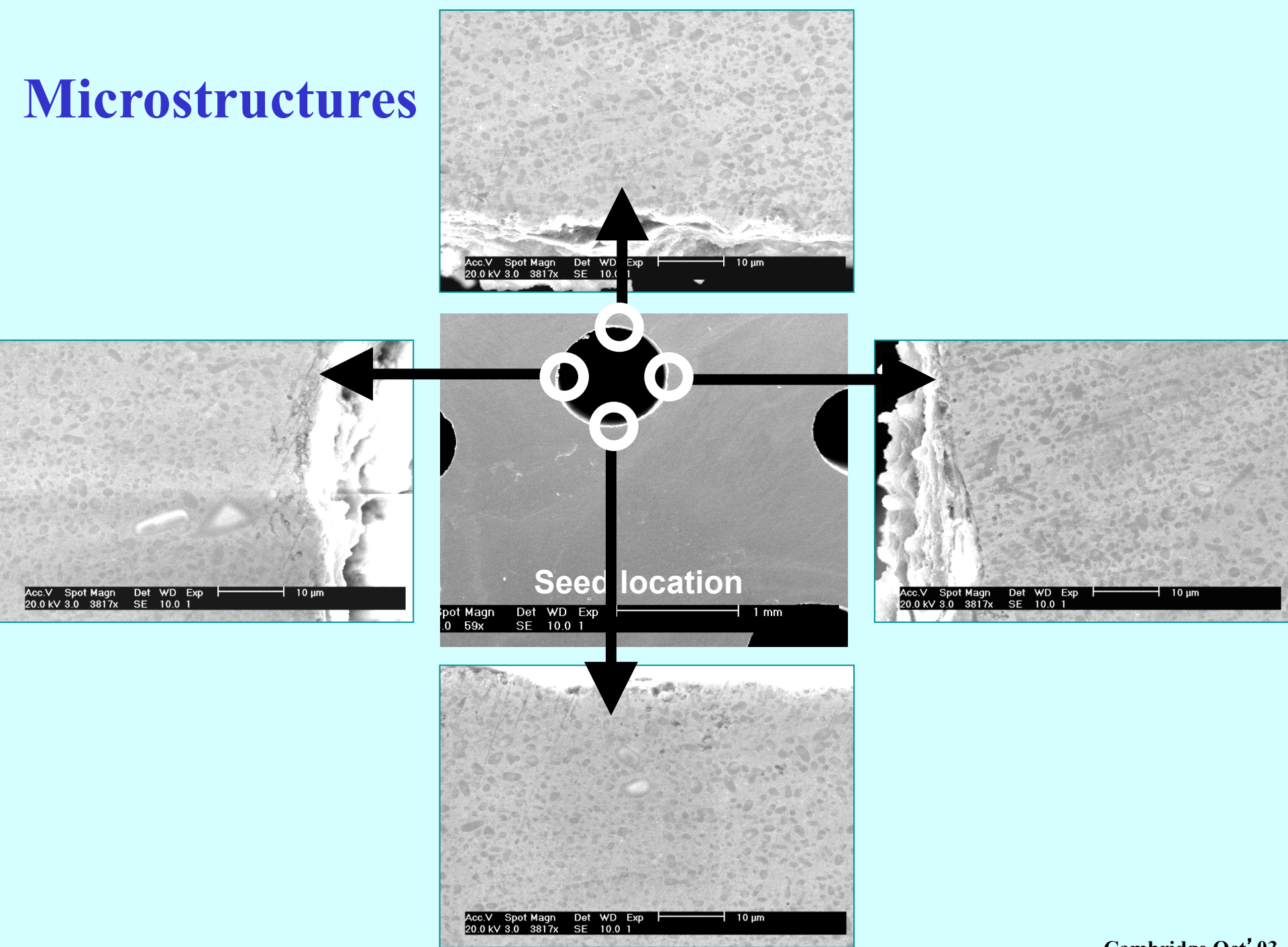
## Process :

- sintering (920°C - 12 hours)
- drilling (0.5 to 2 mm diameter holes)
- conventionnal TSMG and/or melt infiltration growth (Sm123 seed)

# As-process samples

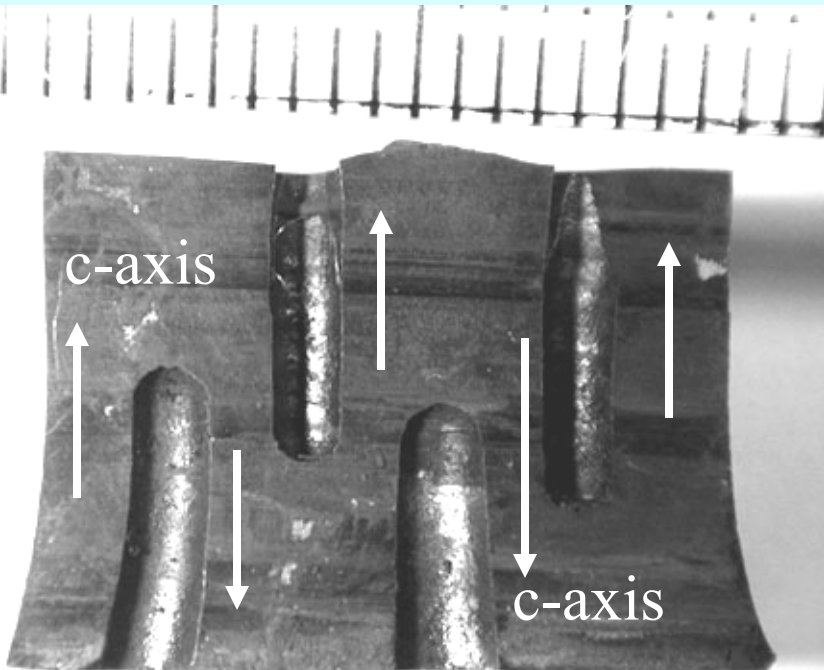
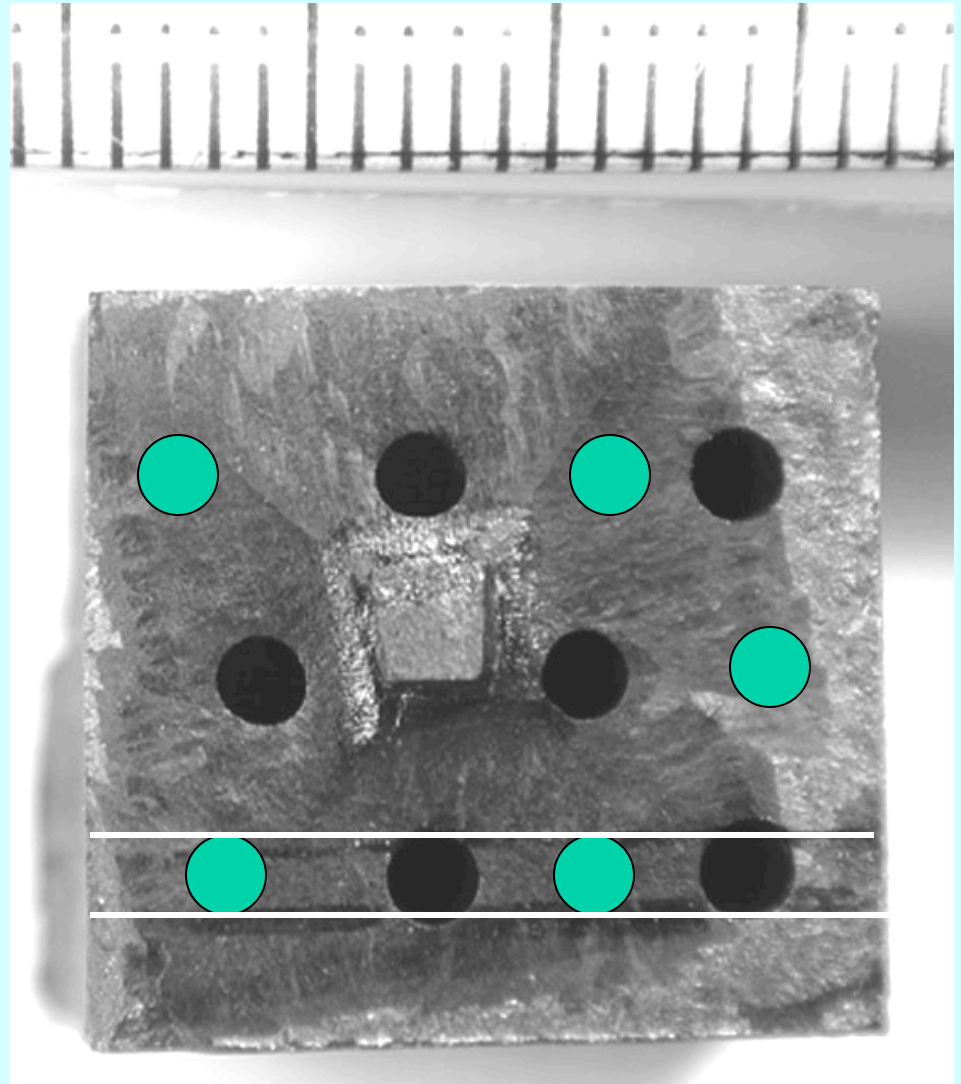
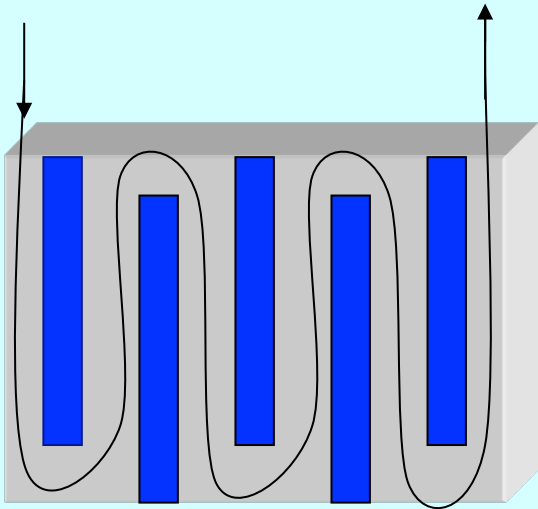


# Microstructures

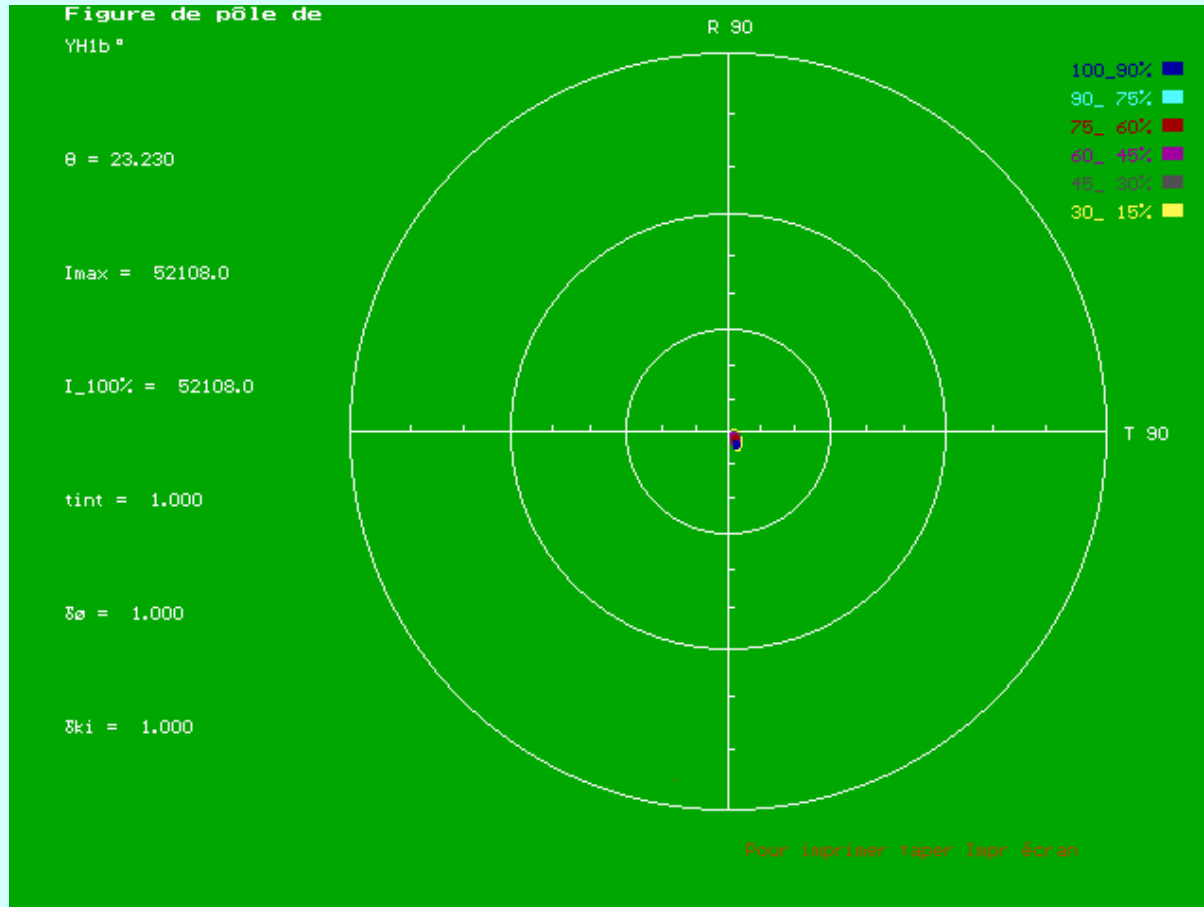




# Meander shape/fault current limiter elements



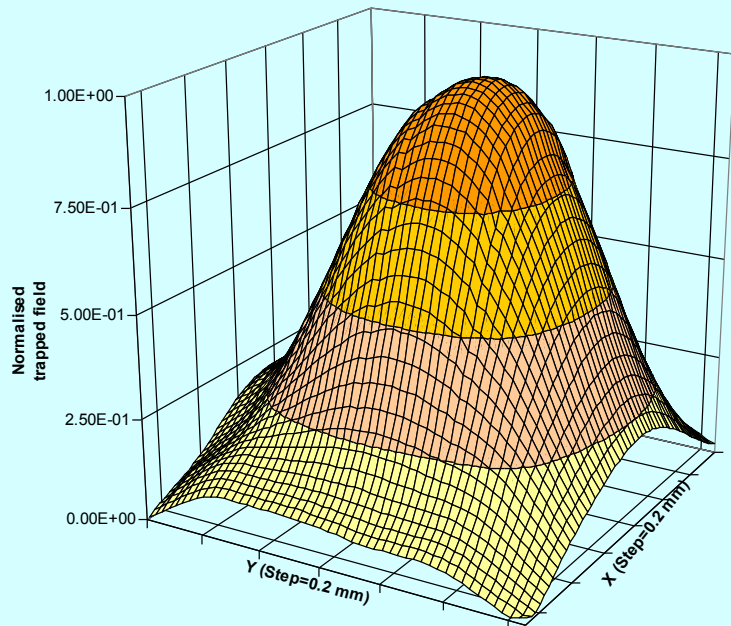
# {006} Pole figure



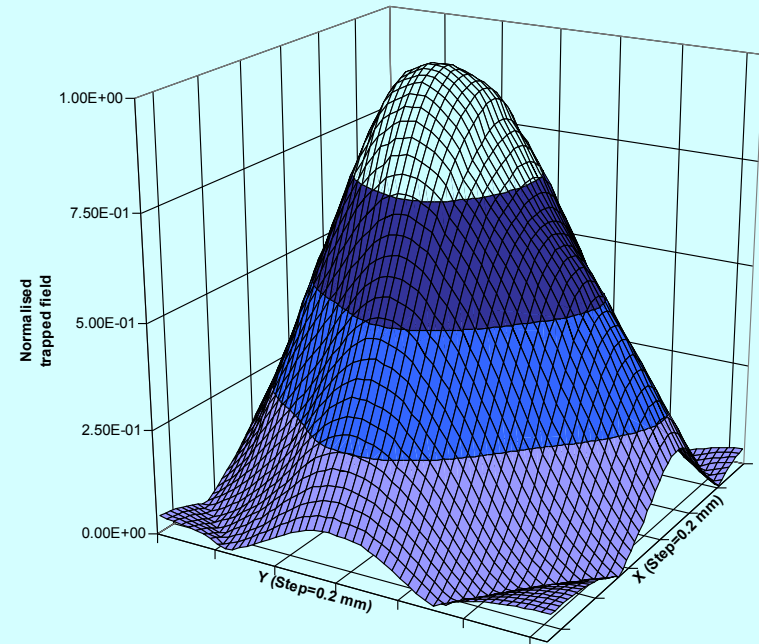


# *Field mapping : FC (0.4 T, 77K)*

**Without hole**



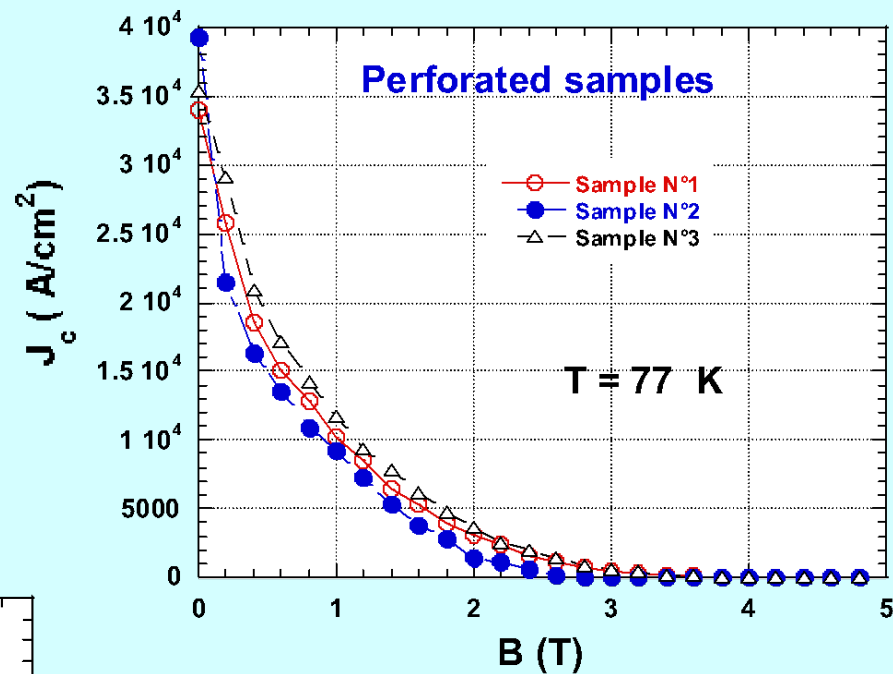
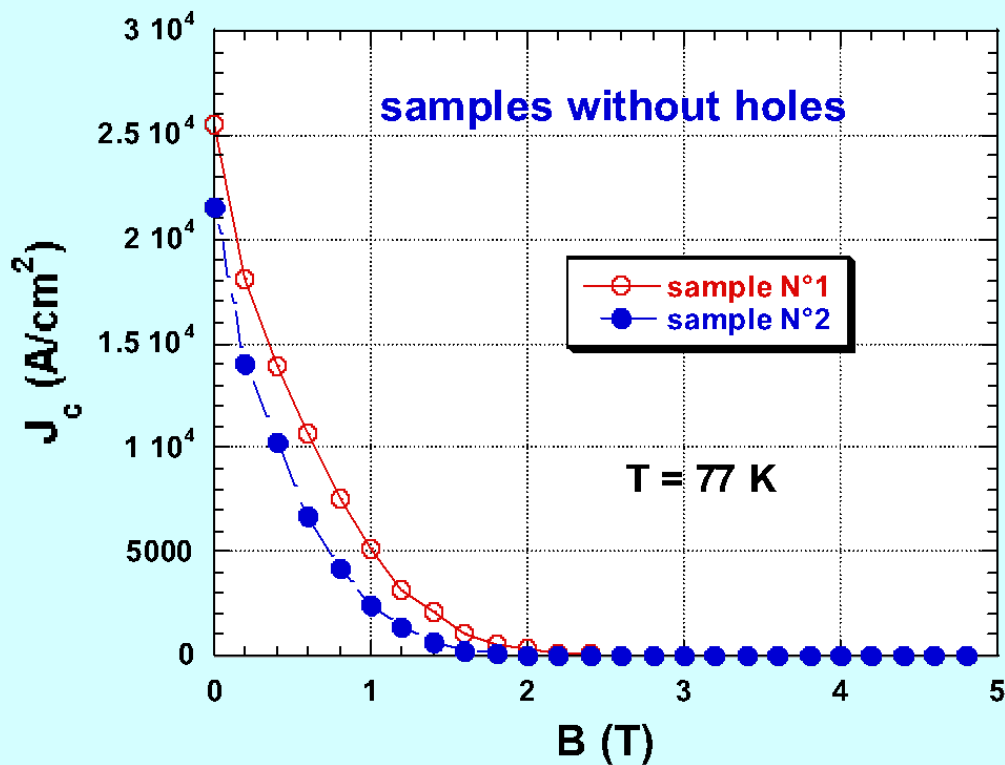
**With hole**



***Similar values of the trapped field***

***No significant perturbation induced by the holes***

# Critical current density



# *Conclusion and outlook*

The perforated samples exhibit a **c-axis grain orientation** confirmed by pole figure and the single domain character is evidenced by trapped-field distribution.

SEM studies have shown that **the hole presence does not hinder the domain growth** and that the typical microstructure is conserved. Further investigations concerning oxygenation effect, transport- $J_c$  measurements, maximum trapped field capacity and **interconnected of regular holes** are under way.