Melt infiltrated/textured YBCO bulks with artificially patterned holes

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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 effets

• Superconducting foam

• 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 %) + CeO$_2$+SnO$_2$

IG : (Y035+x\%Y123) / Y211+ CeO$_2$+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

Figure de pôle de
YHib°

θ = 23.230

I_{max} = 52108.0

I_{100%} = 52108.0

tint = 1.000

S_o = 1.000

S_ki = 1.000
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

Perforated samples

T = 77 K

samples without holes

T = 77 K
**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.