Schoop - AMSC

RABiTS provides a simple architecture
Substrate surface sufficiently smooth as processed
Three buffer layers (CeO_2/YSZ/Y_2O_3) - high rate reactive sputter deposition
Thin buffer stack required to contain Ni-W diffusion; < 250 nm total
Buffer stack improves over Ni/W texture ~ 1 deg.

Scalable in width for cost effective manufacturing
10 cm RABiTS with full texture, > 100 m length
4 cm RABiTS buffer process

Performance
272 A/cm-w over 10 m
380 A/cm-w short results
Mechanical strength of neutral axis conductors meet requirements for most applications

Hou - SuperPower

Substrate electropolishing

Typical speed = 40 m/h R_a = 0.7 nm

Demonstrated speed = 60 m/h

IBAD

Helix tape handling approach adopted - better uniformity

YSZ 15 ea, > 100 m tapes produced, ave. tex. ~ 10.6°, low STD
MOCVD YBCO = 104 A/cm on 97 m

MgO 135 m tapes, 50 micron substrates @ 10 m/h $\Delta\Phi$ = 7 - 8° .
10 X faster than IBAD YSZ, with 11 X smaller deposition area.
MOCVD YBCO = 220 A/cm, 50 micron substrate, Je = 36 kA/cm^2,
Ic > 250 A/cm (0.8 m)

DIrections

Reduce # IBAD MgO template layers

Tailor MgO architecture for MOCVD

High-speed reactive sputtering of all layers

Parans - ORNL

MOD Buffer materials

Identified $CeO_2/La_2Zr_2O_7$ as multi-functional buffers on Ni/W

Very good texture using 4 cm wide RTR processing

AMSC MOD YBCO

I_c = 213 A/cm on AMSC CeO_2/YSZ/MOD $La_2Zr_2O_7$/NiW

I_c = 140 A/cm on MOD CeO_2/MOD $La_2Zr_2O_7$/NiW

Directions

Target of 300 A/cm

100-200 nm thick single LZO coat

Meter lengths of all MOD buffers

Jia - LANL

PLD STO

Emphasized chemical & thermal stability; lattice match to YBCO

PLD YBCO/STO/IBAD MgO

Single layer YBCO = 400 A/cm (~ 1.5 micron thick)

Multiple layer YBCO/CeO_2 = 660 - 1400 A/cm (~ 1.7 - 3.6 micron thick)

PAD: Polymer Assisted Deposition

Simple, low cost, non-vacuum buffer process

HRTEM showed high quality films

Amenable to multi layers, complex oxides, thick films (100-1000 nm)

Directions

Implement PAD process in YBCO/IBAD architecture?

Clem - SNL

MOD STO

STO/CTO/NiW very promising
Good barrier (0.2 - 0.5 micron) to O_2 and substrate element diffusion
Good replication of substrate texture (~ 0.5 deg. Less)

AMSC YBCO/CeO_2 on STO/CTO/NiW

139A/cm (~ 0.8 micron thick)

Directions

Reduce RMS surface roughness
Continue to search for better lattice match buffers (goal: single material)