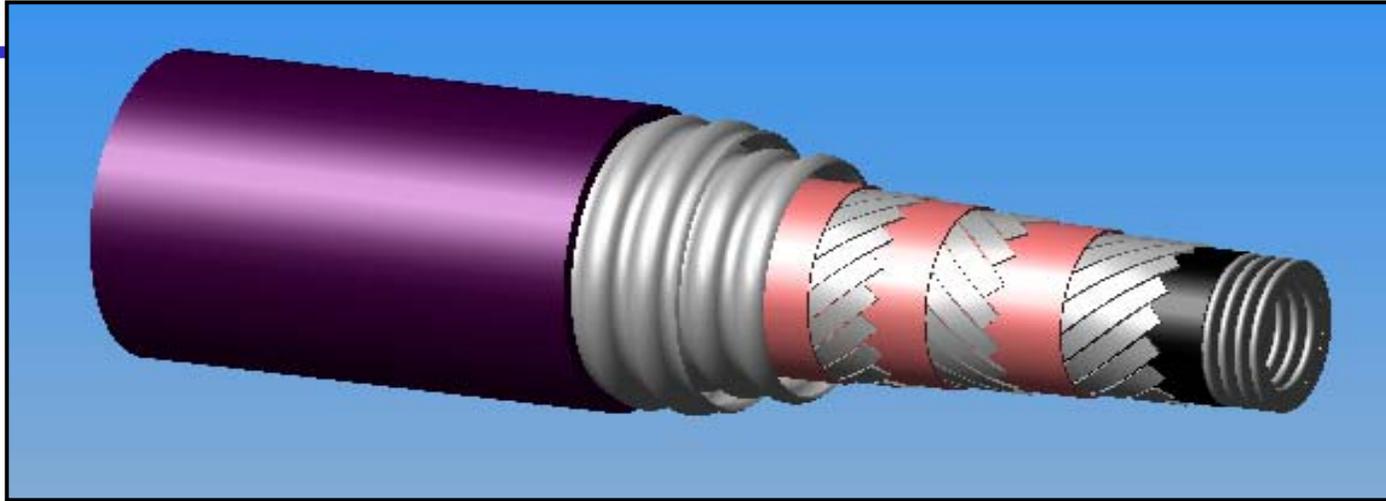

Cable Applications of YBCO Coated Conductors

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Power Cable Applications



- Single or 3-phase cable constructions.
- Tapes wrapped helically around central core (25–36mm former).
- Stress/strain requirements of stranding, installation & cool-down.
- Moderate c-axis compression due to (1) outer cable layers, and (2) side-wall-bearing pressure from installation.
- Cables must be flexible for commercial applications.
- Expect multiple thermal cycles during life (30-40 yrs) of cable.

Mechanical Properties

Physical Dimensions

- Width = 4.0 – 4.2mm
- Thickness = insignificant

Stress

- ≥ 90 -100 MPa ($\geq 95\%$ Ic retention)

Strain

- $\geq 0.3\%$ ($\geq 95\%$ Ic retention)

Tension vs. Compression

- Tape will experience
 - Tension \rightarrow outside of bend
 - Compression \rightarrow inside of bend



“Right-side-up”
dependence of tape?

Electrical Properties

I_c (not J_c) – end-to-end transport current

- Similar to today's BSCCO is OK
- 100-150 Amp per 4mm width

Non-magnetic

- Substrate and all other layers non-magnetic for AC loss optimization.

Behavior around I_c → fault current response

- How do YBCO tapes behave?
- N-value? (lower is better)
- Normal resistivity?

Environmental

Corrosion

- No corrosion over time when exposed to open, varied atmospheric conditions

Oxidation

- No oxidation over time when exposed to open, varied atmospheric conditions

Stability after Thermal/Pressure cycling in LN

- Tape will experience many thermal and pressure cycles in LN – must be stable with no degradation.

Handling

General Handling Tolerances

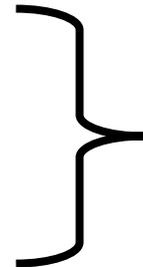
- No "white-glove" requirements.

Solderability

- Tapes must be easily soldered with standard fluxes & solders. No mechanical or other chemical cleaning required.

Joining Techniques (lap joints OK??)

- YBCO-YBCO
- YBCO-BSCCO
- YBCO-Cu



- Must be able to join tapes with <1.0 Watt generated across cable splice (~200 tapes joined).
- Joints must be strong enough to withstand previous stress requirements.

Conclusions

We Want:

– **Drop-In Replacement for BSCCO**

- Same width → use existing manufacturing
- Same stress/strain tolerances
- Better handling/environmental than BSCCO
 - No oxidation
 - No cleaning requirements
 - Easy connectivity
- $I_c = 100\text{-}150\text{ A}$ per 4mm width
- Price = cheap, cheap, cheap.....