IGC's Nb_3Sn Status

Eric Gregory

VLHC , Danford's Inn, Port Jefferson, LI, NY, Nov 16-18 1998

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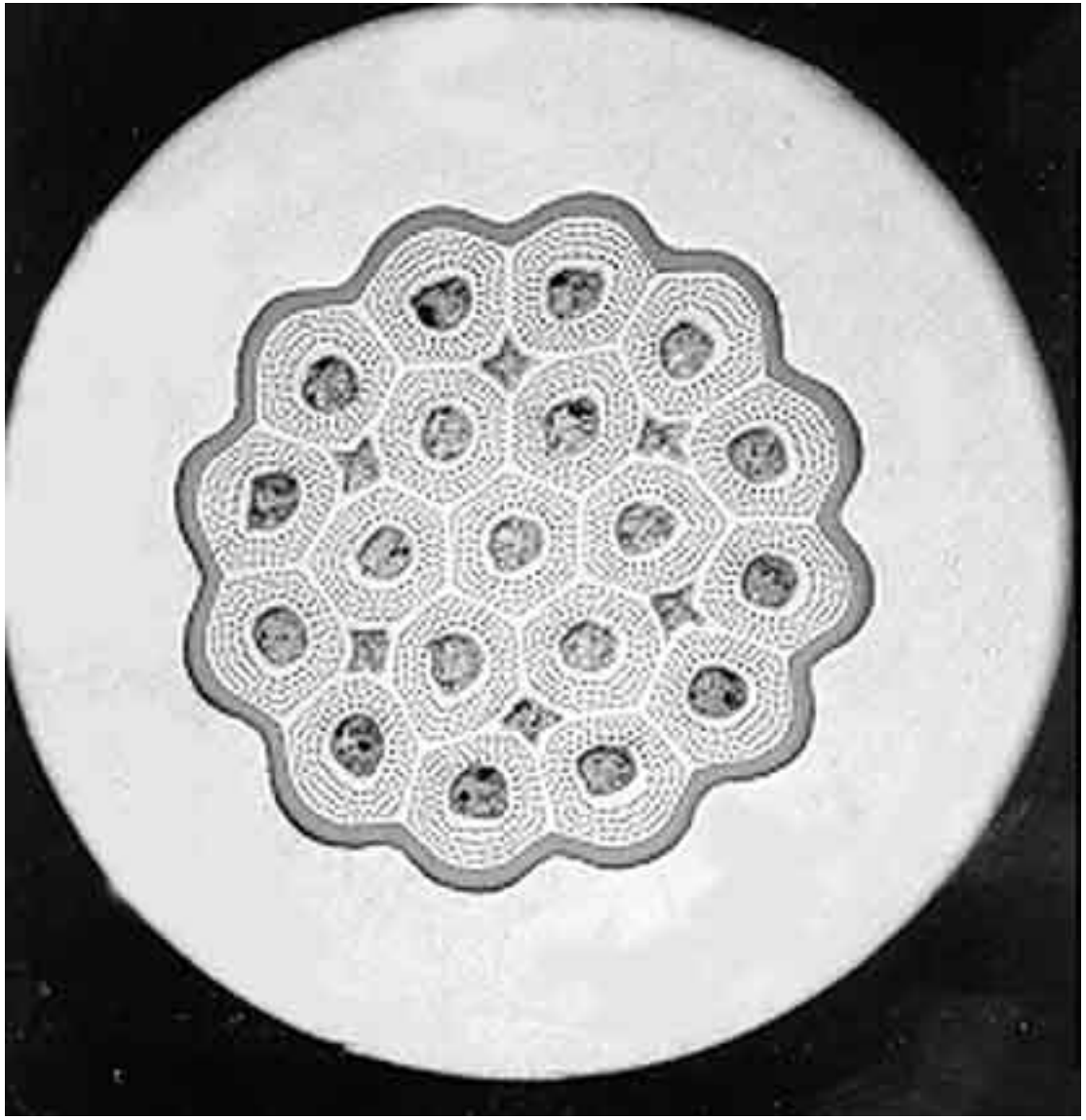

ITER Design

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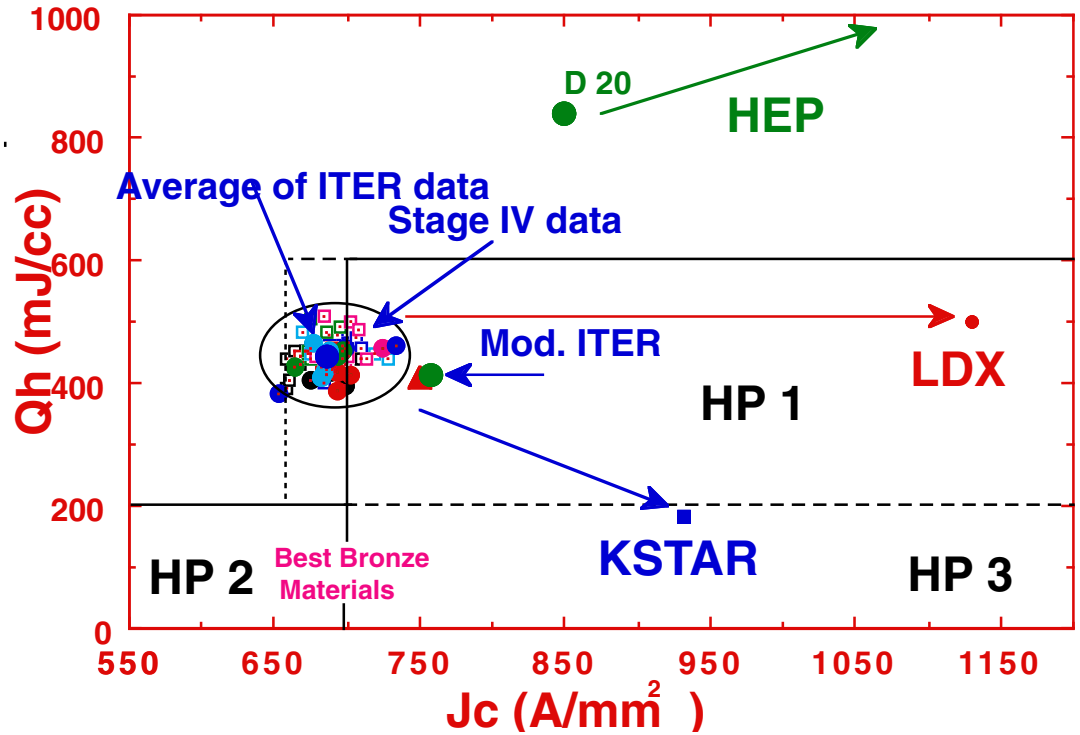
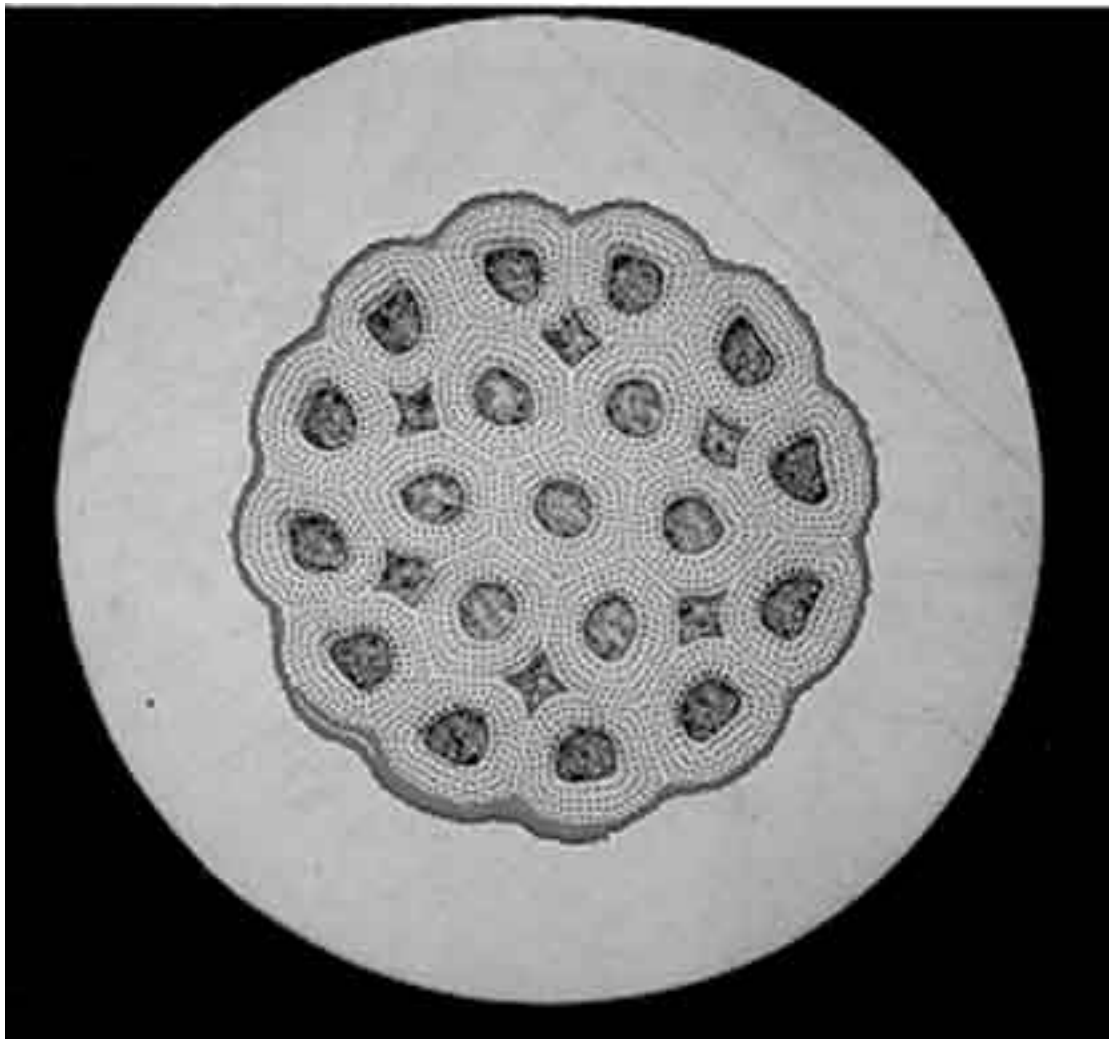

1000
800
600
400
200
0
Qh (mJ/cc)
550
650
750
850
950
1050
1150
Jc (A/mm2)
D 20
HEP
Average of ITER data
Stage IV data
Mod. ITER
LDX
HP 1
KSTAR
HP 2
Best Bronze
Materials
HP 3



Low Loss, HP 3, Design

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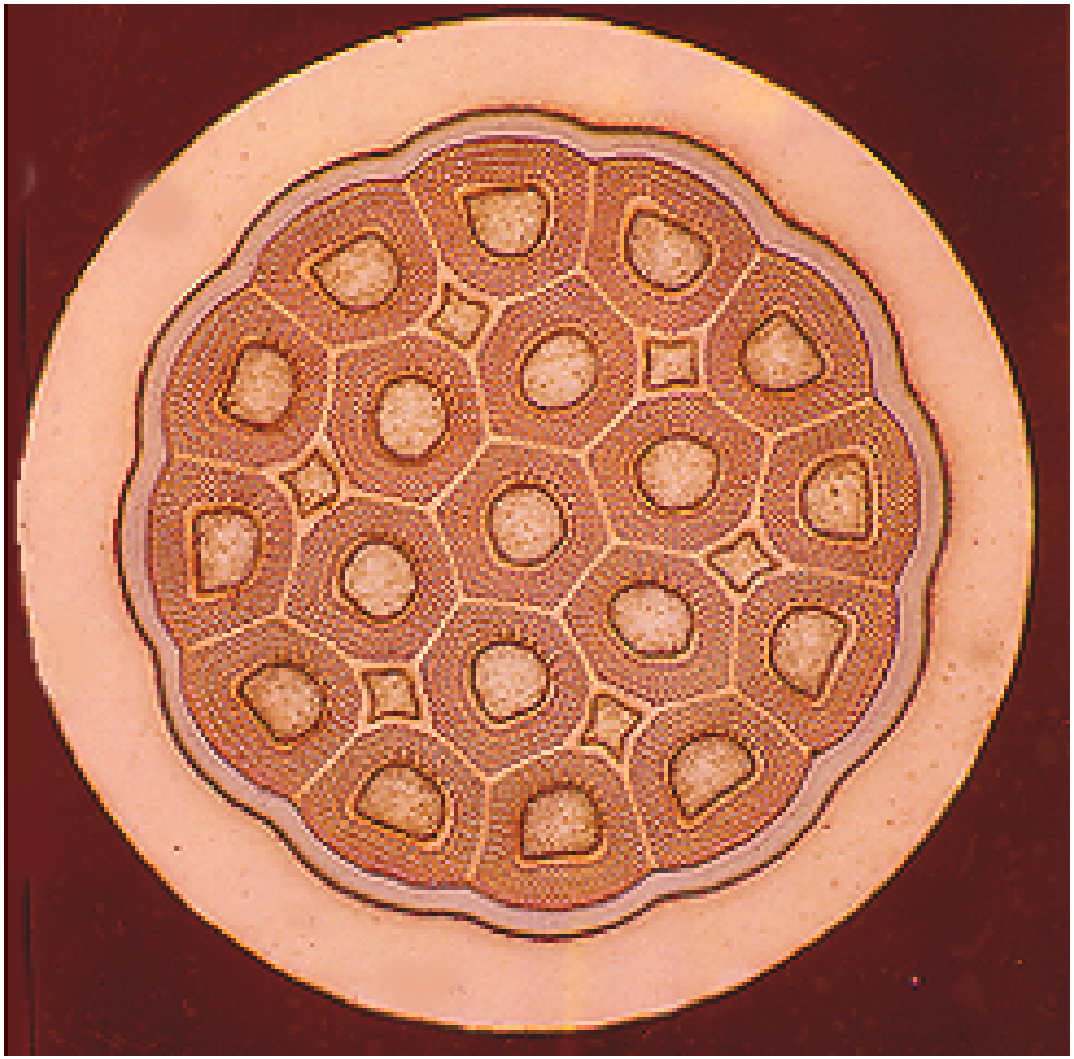

D 2

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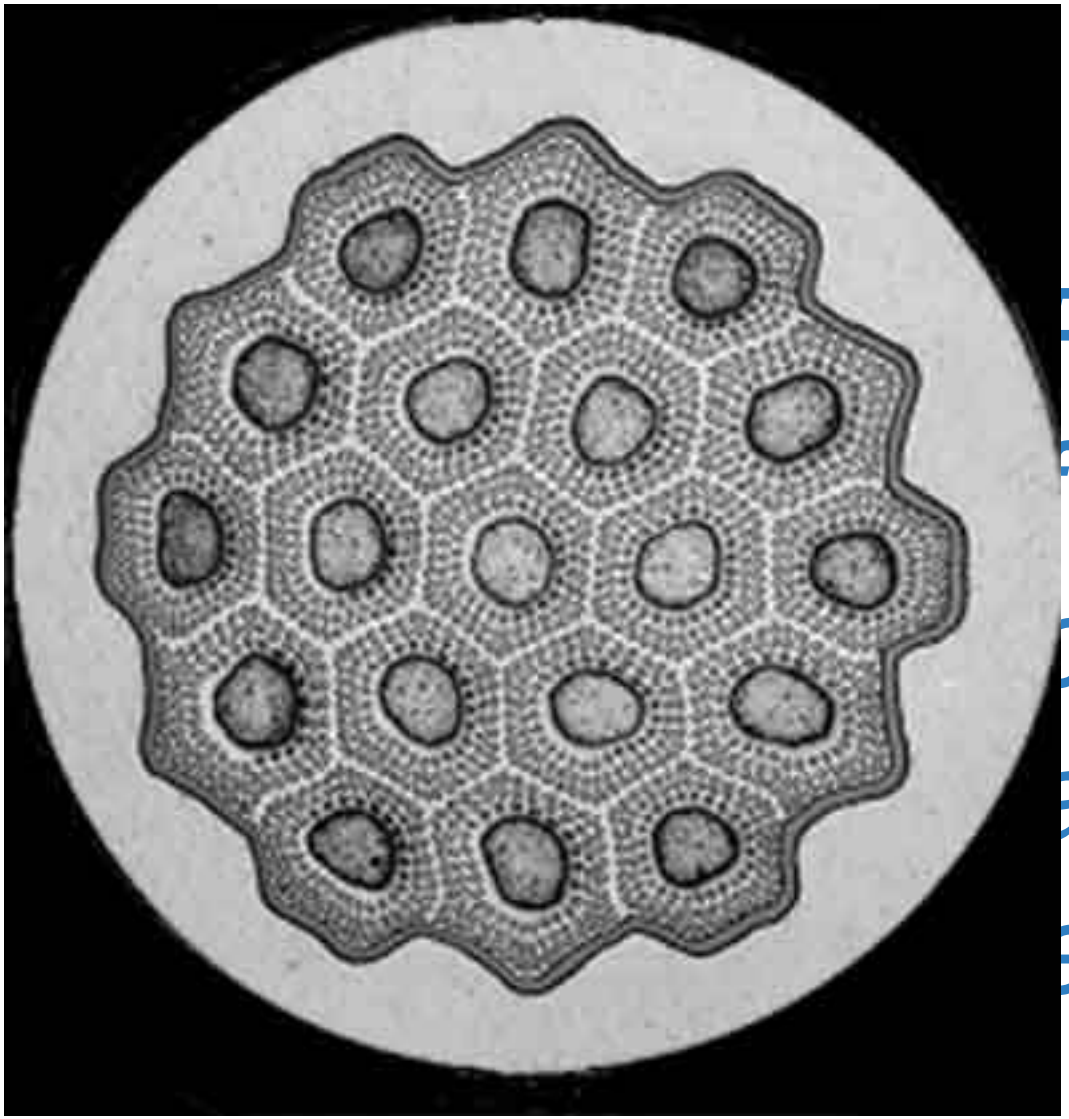

Recent Design
f or TF Coils &
other fusion
applications ,
e .g.TDX-Fcoils

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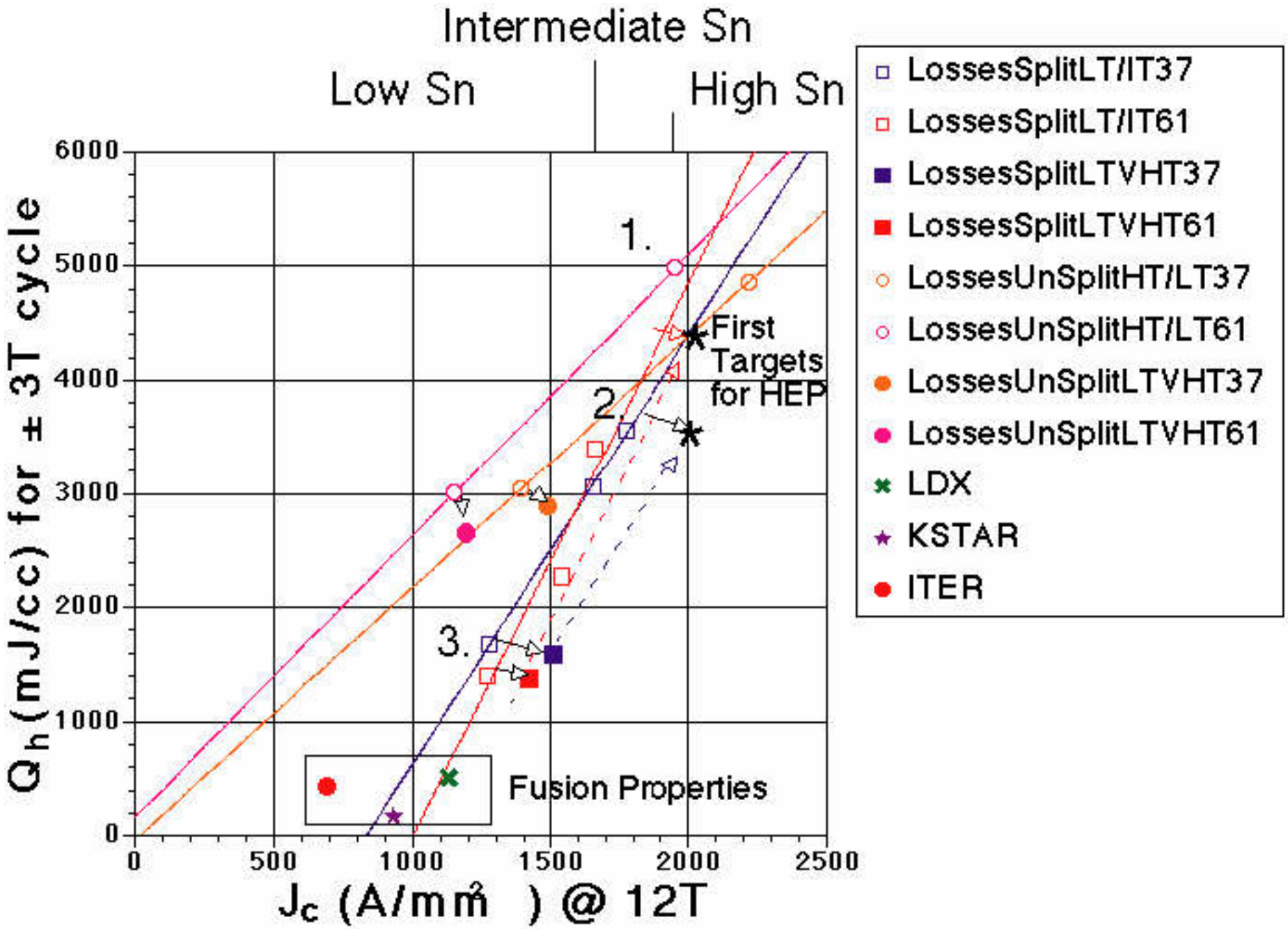
To make Nb_3Sn more viable for HEP:

Increase J_c.
Reduce losses (d_{eff}).
Reduce flux jumping & improve stability.
Reduce strain sensitivity.
Reduce costs.

Variables affecting proprties

1. Alloy composition
2. Alloy quantity
3. Tin quantity
4. Barrier composition, thickness and location
5. Subelement number
6. Subelement design
7. Presence or absence of spacers
8. Heat treatment conditions
9. Copper percentage



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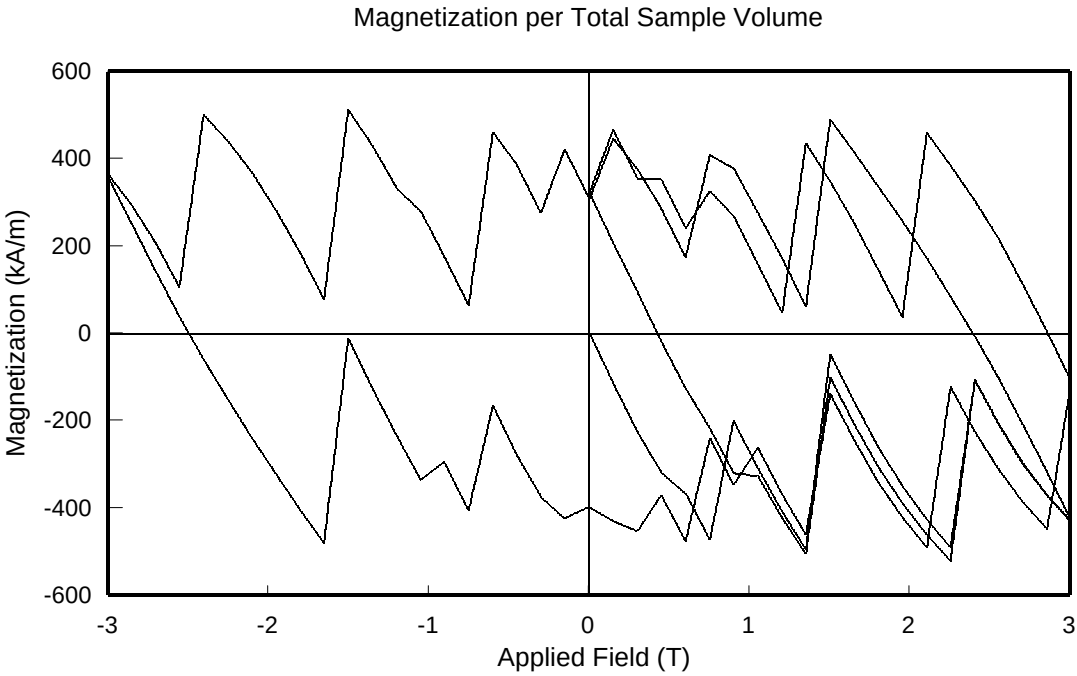
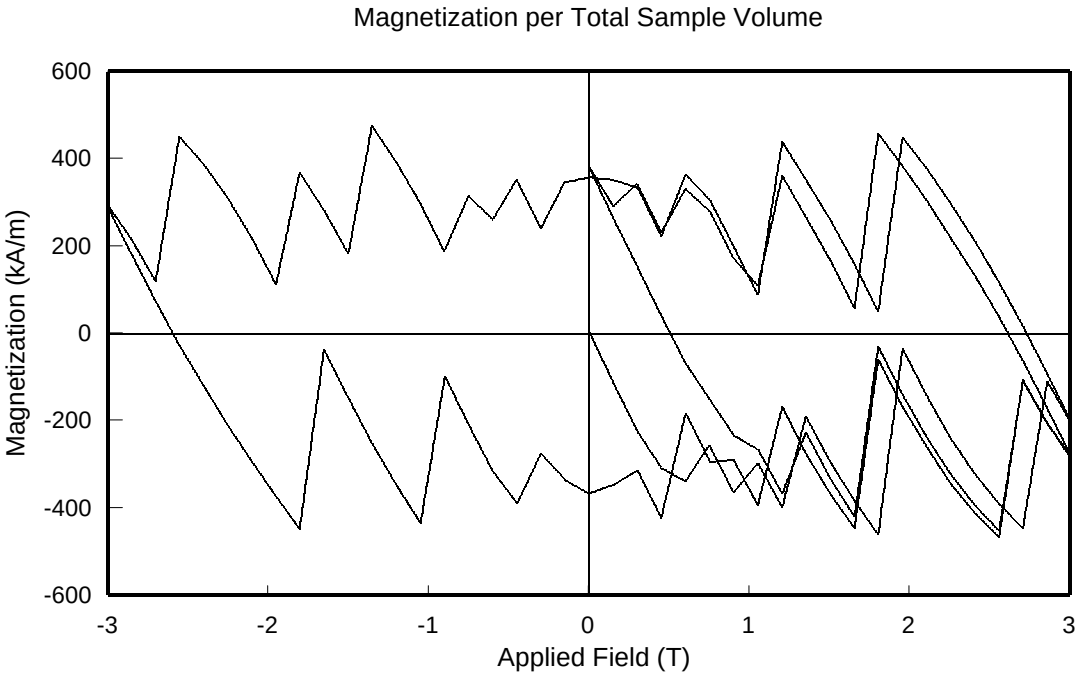
Design	J_c 12T (A/mm^2)	Q_h(mJ/cm^3)	d_{eff3T}	d_{eff5T}
Not Split				
High Sn 37	2200	4860		
High Sn 61	1954	4986		
Low Sn 37	1392	3040	92	127
Low Sn 61	1150	3001	116	110
Low Sn 37 VHT	1488	2891	84	81
Low Sn 61 VHT	1191	2652	89	86
Split				
Low Sn 37	**1277**	**1679**	**54**	**50**
Low Sn 61	**1268**	**1397**	**43**	**40**
Low Sn 37 VHT	**1506**	**1582**	**43**	**41**
Low Sn 61 VHT	**1419**	**1377**	**41**	**38**
Int Sn 37 100	**1652**	**3060**	**93**	**88**
Int Sn 61 100	**1536**	**2270**	**63**	**61**
Int Sn 37 200	**1772**	**3553**	**136**	**127**
Int Sn 61 200	**1649**	**3403**	**102**	**97**


Magnetization per Total Sample Volume
600
400
200
0
-200
-400
-600
Magnetization (kA/m)
-3
-2
-1
0
1
2
3
Applied Field (T)


Magnetization per Total Sample Volume
600
400
200
0
-200
-400
-600
Magnetization (kA/m)
-3
-2
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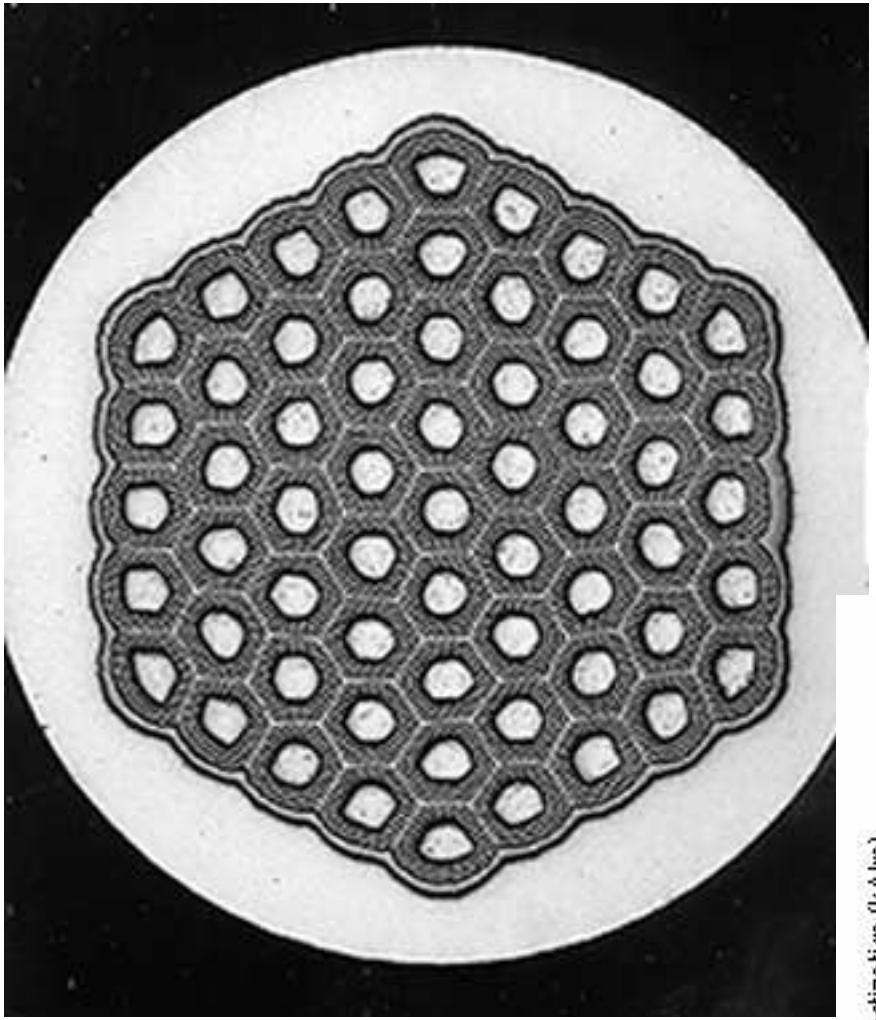
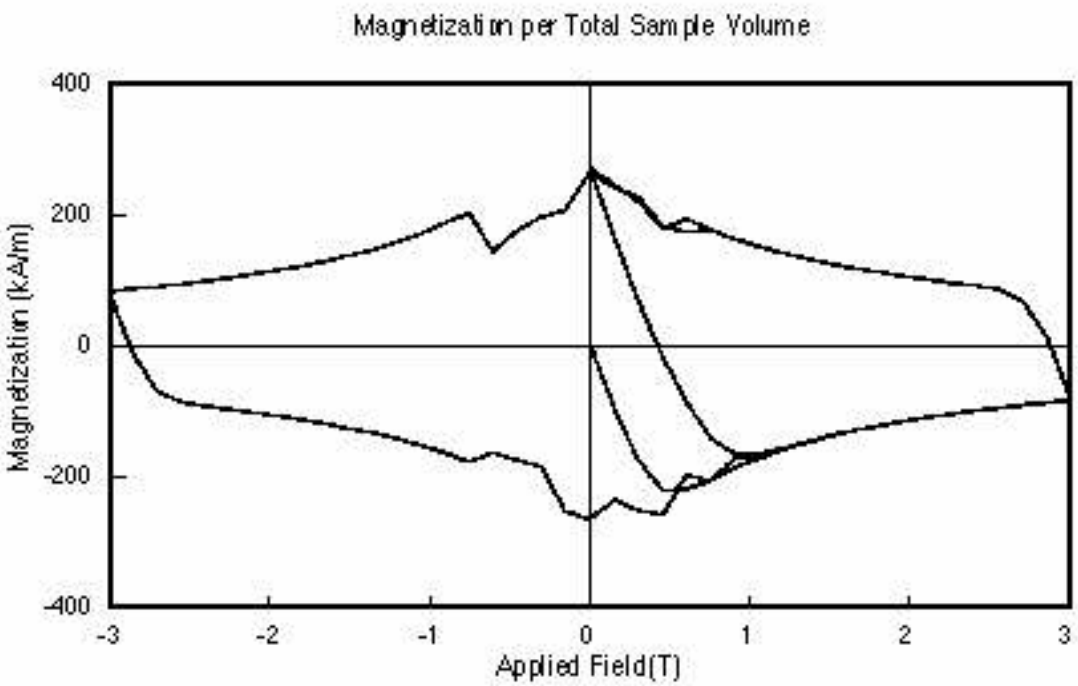
0
1
2
3
Applied Field (T)



Cross Section 61 subelement single barrier restack



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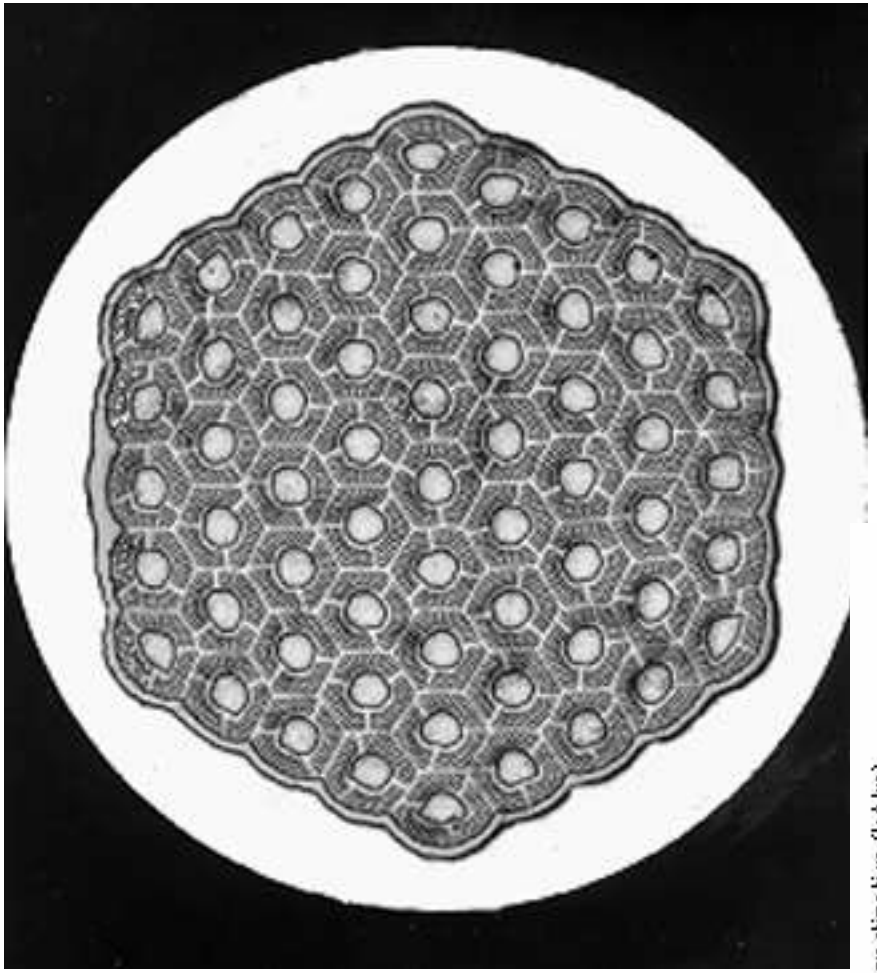
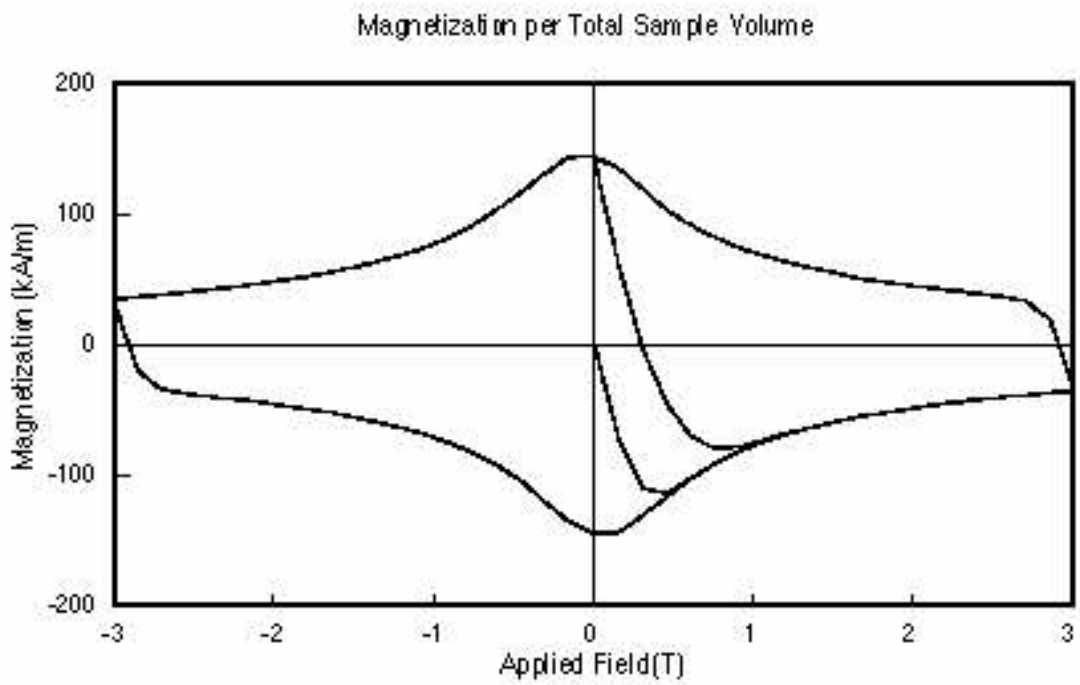


Cross Section 61 subelement split core restack



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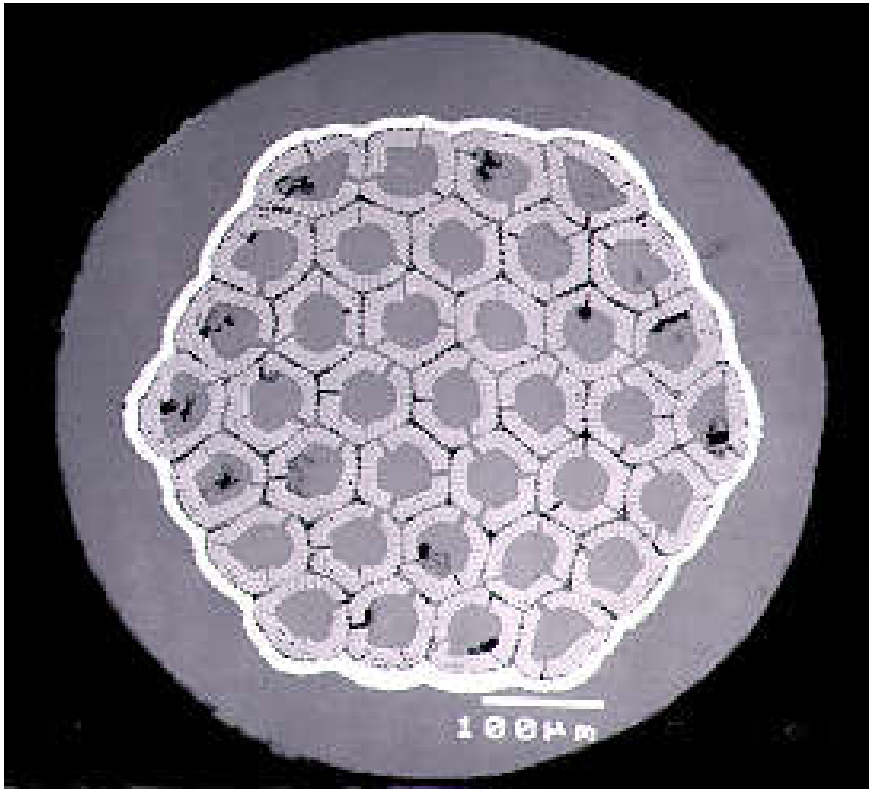
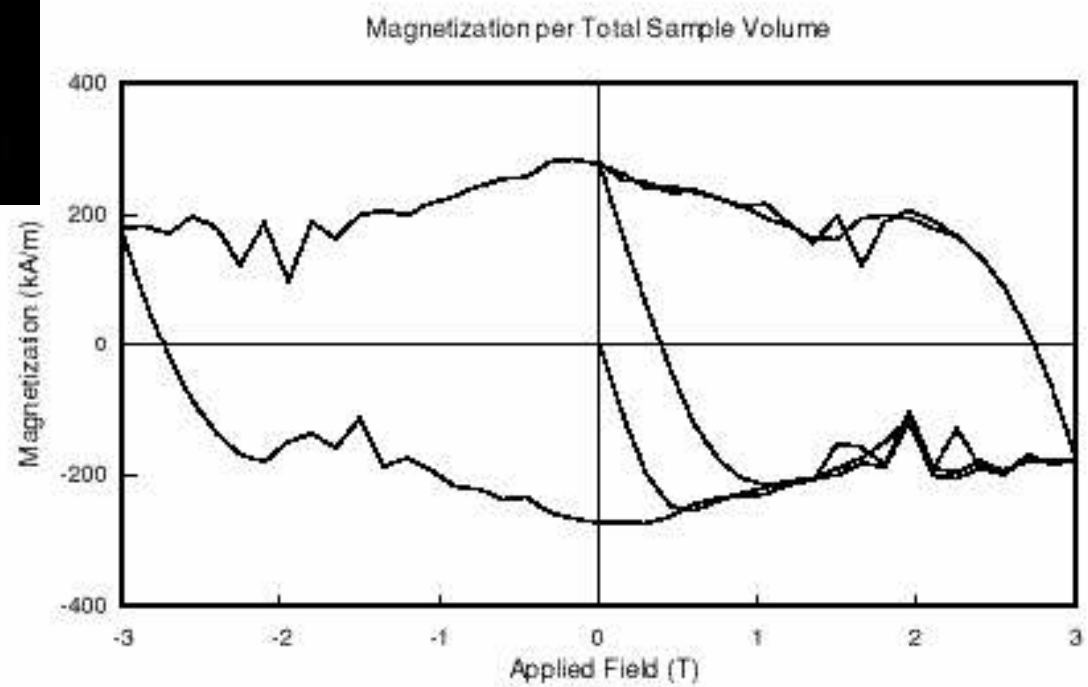


37 split core restack



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