# The Rare Earth (RE) Influence upon the Magnetic and Optical Properties of RE-FeCo Thin Films

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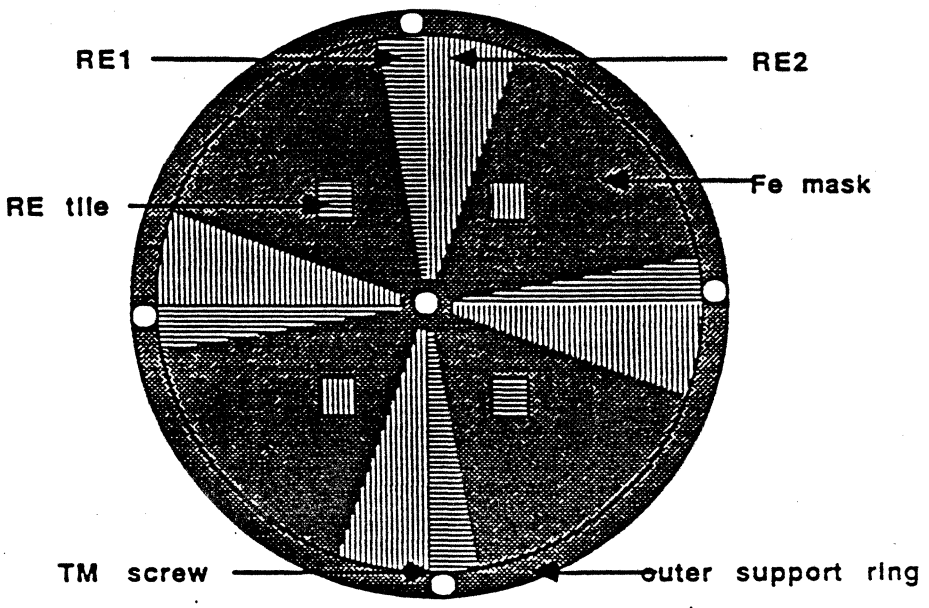
R.F. Sputtering using a masked composite target




other parameters held constant:

Argon Pressure: 30 mTorr  base pressure: < 0.5 microTorr

Target Voltage: 1kV  Substrate Voltage: 140V

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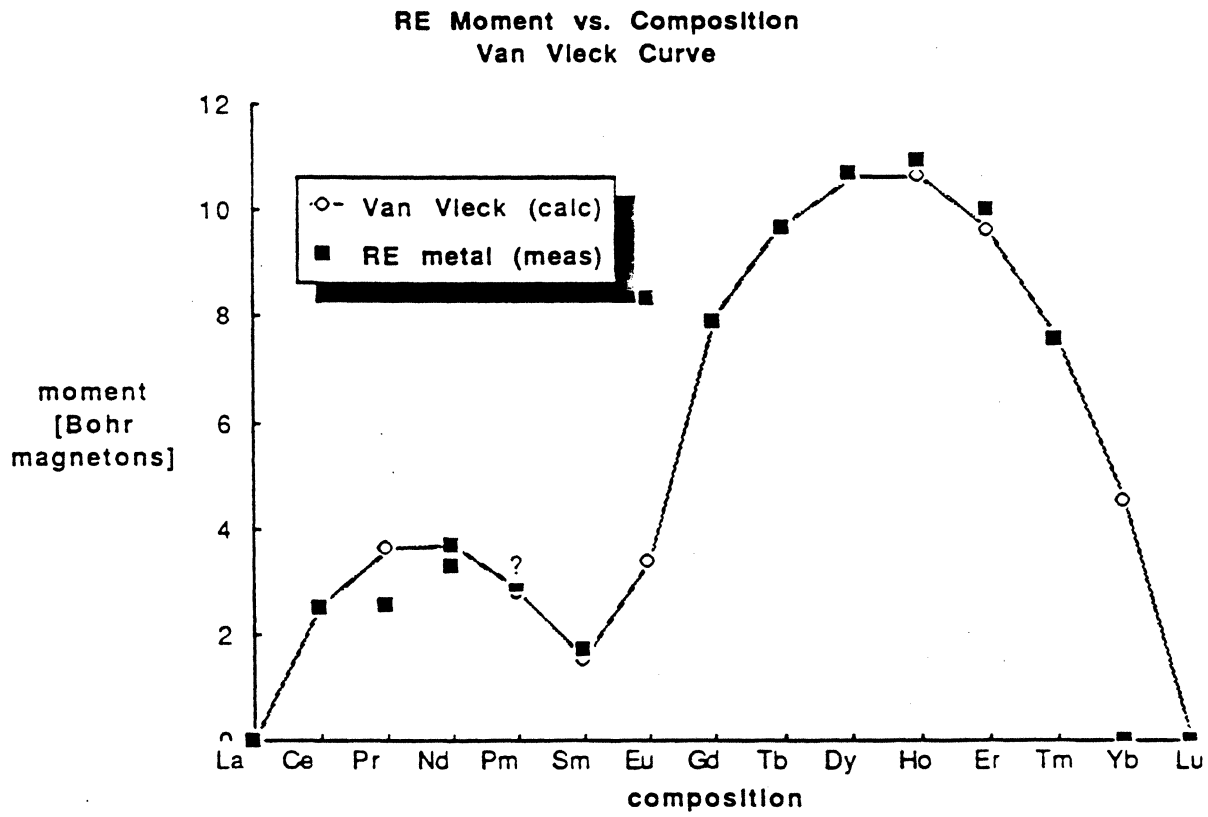
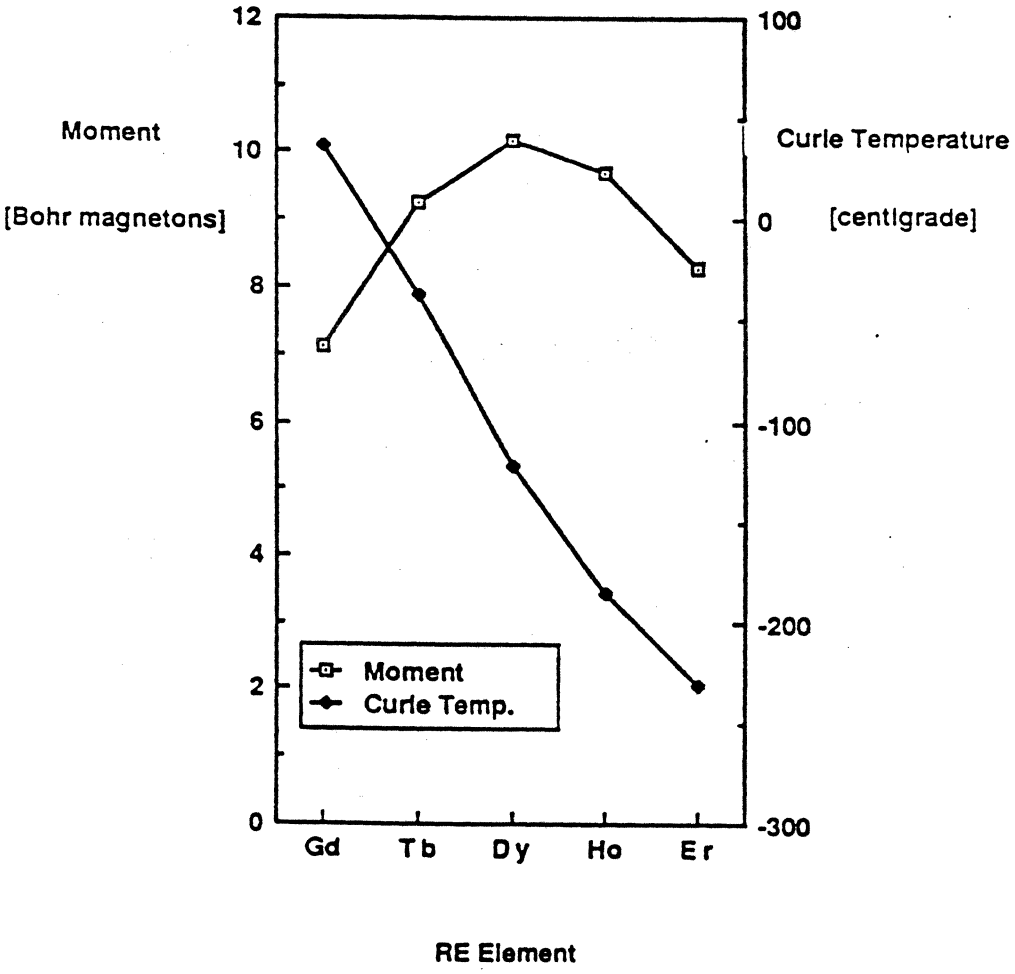
Characterization using

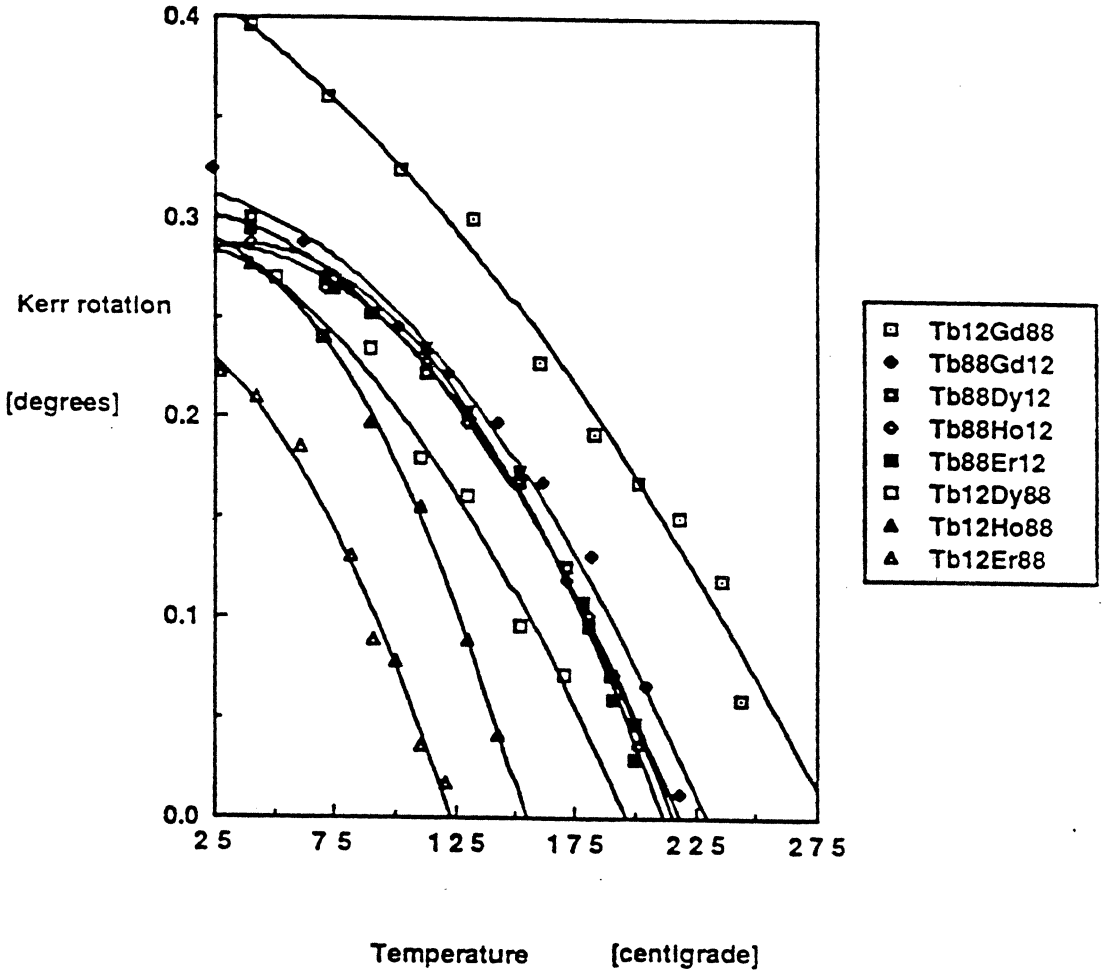
a polar Kerr effect hysteresis loop tracer

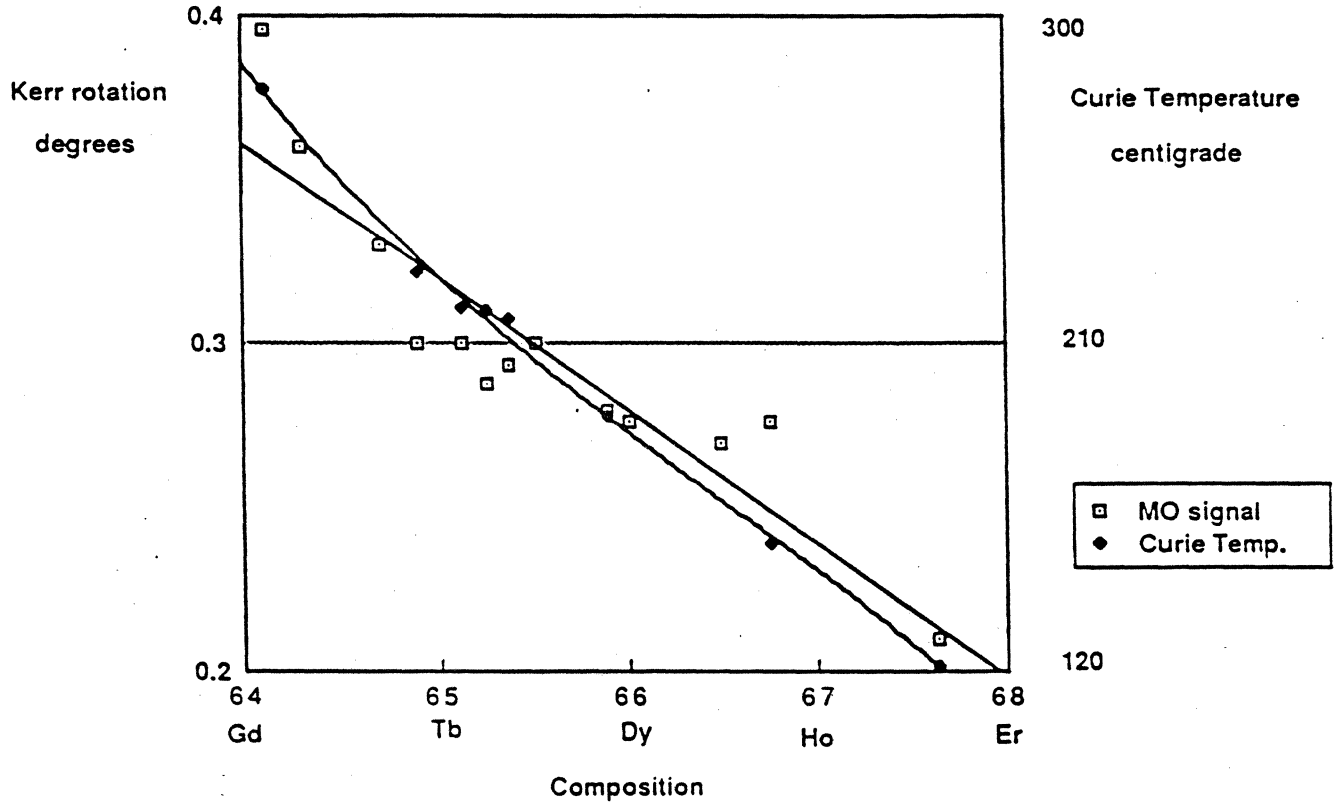
to measure Kerr rotation and Hc

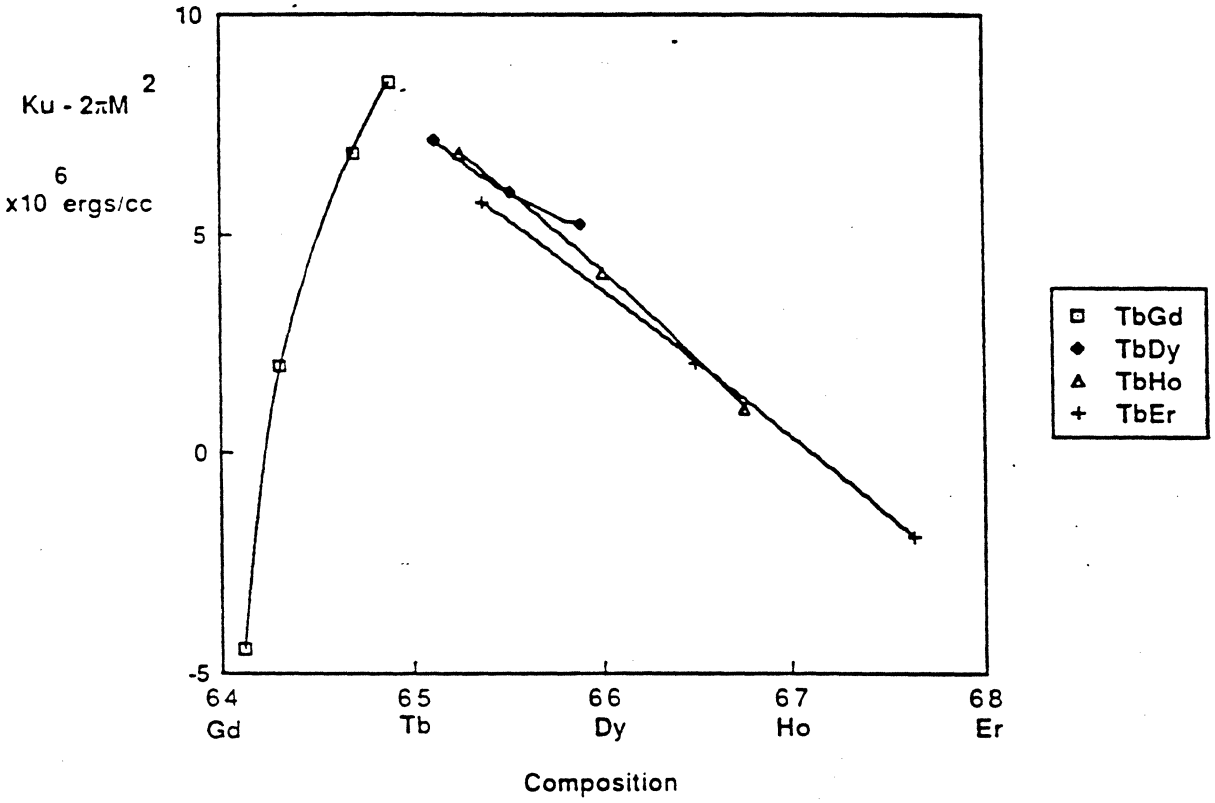
at various temperatures.

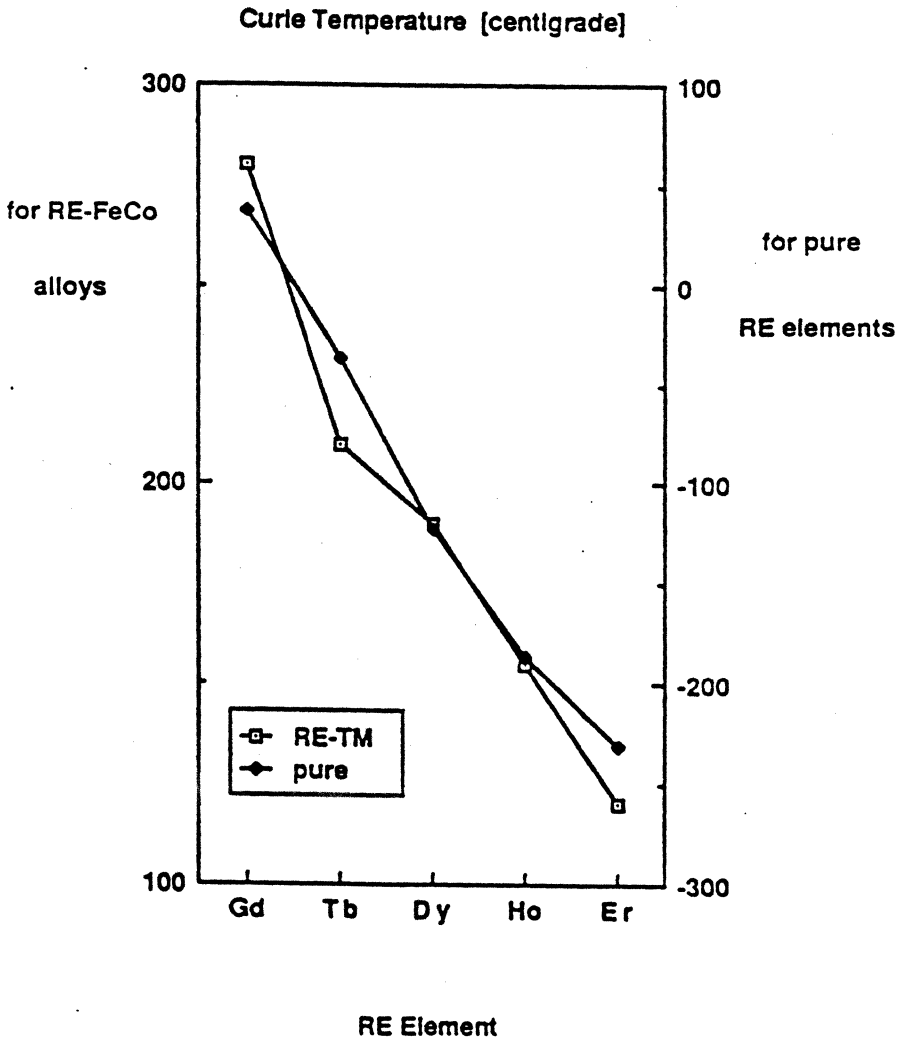

RE Moment vs. Composition
Van Vleck Curve
Van Vleck (calc)
RE metal (meas)
moment [Bohr magnetons]
12
10
8
6
4
2
0
?
La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
composition


Moment
[Bohr magnetons]
12
10
8
6
4
2
0
Curie Temperature
[centigrade]
100
0
-100
-200
-300
Moment
Curie Temp.
Gd
Tb
Dy
Ho
Er
RE Element


0.4
0.3
0.2
0.1
0.0
Kerr rotation
[degrees]
25
75
125
175
225
275
Temperature [centigrade]
Tb12Gd88
Tb88Gd12
Tb88Dy12
Tb88Ho12
Tb88Er12
Tb12Dy88
Tb12Ho88
Tb12Er88


0.4
0.3
0.2
Kerr rotation
degrees
300
210
120
Curie Temperature
centigrade
MO signal
Curie Temp.
64
Gd
65
Tb
66
Dy
67
Ho
68
Er
Composition


Ku - 2πM 2
6
x10 ergs/cc
10
5
0
-5
64
Gd
65
Tb
66
Dy
67
Ho
68
Er
Composition
TbGd
TbDy
TbHo
TbEr


Curie Temperature [centigrade]
300
200
100
for RE-FeCo
alloys
100
0
-100
-200
-300
for pure
RE elements
RE-TM
pure
Gd
Tb
Dy
Ho
Er
RE Element

## Conclusions

For fixed sputtering conditions
and fixed TM composition:

Increasingly heavier RE composition
lowers the Curie temperature and
indirectly lowers the MO signal

The MO signal correlates with
Curie temperature, but
not with Ku-$2\pi M^2$

Coercivity and anisotropy are
largest in Tb based alloys

# ERASABLE OPTICAL DISK DRIVES
# EXPECTED SHIPMENTS

88
~~1987~~

**EVALUATION UNITS IN SMALL QUANTITIES**

89
~~1988~~

**PRODUCT EVALUATION AND SYSTEM INTEGRATION**

90
~~1989~~

**PRODUCTION QUANTITIES AVAILABLE**

# CONCLUSIONS:
# MAGNETO-OPTICAL RECORDING

## Bit Density

- o $7 \times 10^7/cm^2$
- o Order of Magnitude Improvements Possible

## Data Rate

- o To 25 MHz From Single Channel
- o Parallel Read/Write Heads Possible

## Access Time

- o Initial Products: 100 msec
- o Order of Magnitude Improvements Possible