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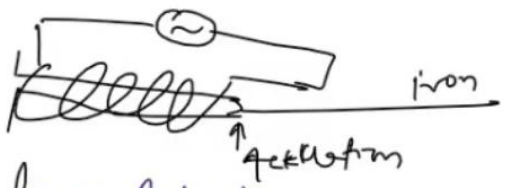
SMI-L-12

Thursday, February 24, 2022 2:25 PM

Magneto-strictive

ferro-magentic material → deformation

Magnetic



→ Direct effect

→ Converse effect

Mag → Mechanical → Actuation

Mech → Mag → Sensor

D

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07:01 1:03:36

100%

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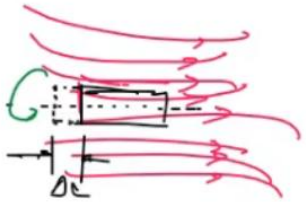
Direct Effect
Converse effect

Mag → Mechanical → Actuation
Mech → Mag → Sensor

} Longitudinal motion

Gallium-Ferrous → GalfNOL
TerfeNOL-D



Rotation

Helical Magnetic field → Twisting action

Wiedemann Effect

↓

Matteuci Effect → Application of torque → Change in magnetization

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14:24 1:03:36

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Actuation

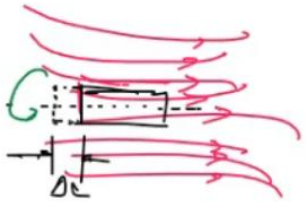
Direct Effect — Mag → Mechanical → Actuation

Converse effect — Mech → Mag → Sensor

} Longitudinal motion

Gallium-Ferrous → GaFeNOL

TerfeNOL-D



Rotation

Helical Magnetic field → Twisting action

Wiedemann Effect ~~Sens~~ Actuator

↓

Matteuci Effect → Application of torque → Change in magnetization

Sensor

D

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Matteucci Effect → Application of torque → Change in magnetization

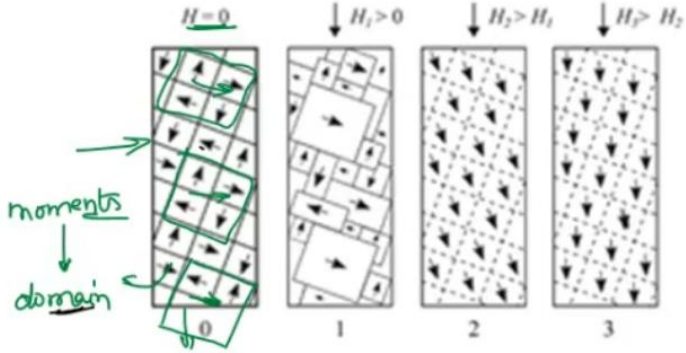
sensor

Mechanism

Ferromagnetic material

iron

magnetic moments



Isotropic ← randomly oriented

Anisotropic ← systematic oriented formation

D

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Matteucci Effect → Application of torque → Change in magnetization

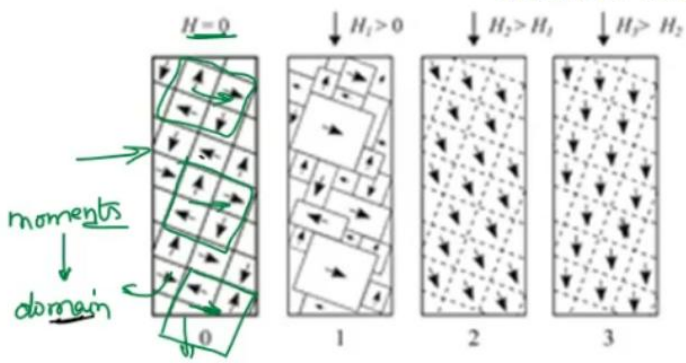
sensor

Mechanism

Ferromagnetic material

iron

magnetic moments

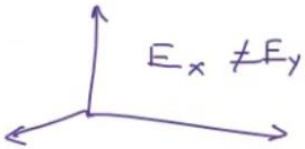


$E_x = E_y = E_z = E$

Isotropic ← randomly oriented

Anisotropic ← systematic oriented formation

$E_x \neq E_y \neq E_z$



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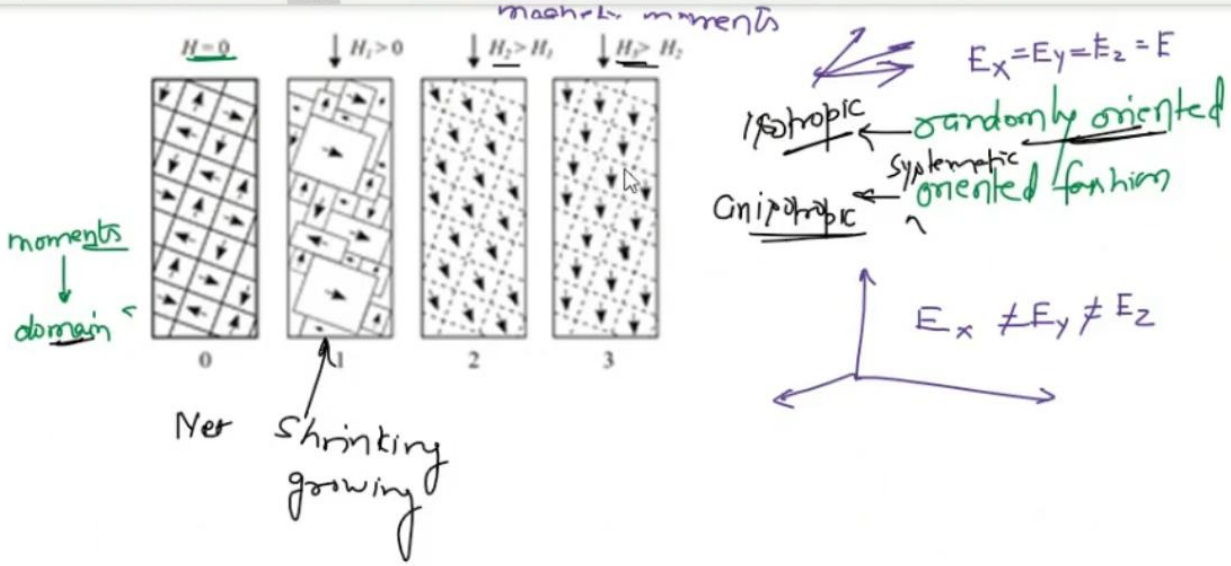

28:01 1:03:36

25°C Haze

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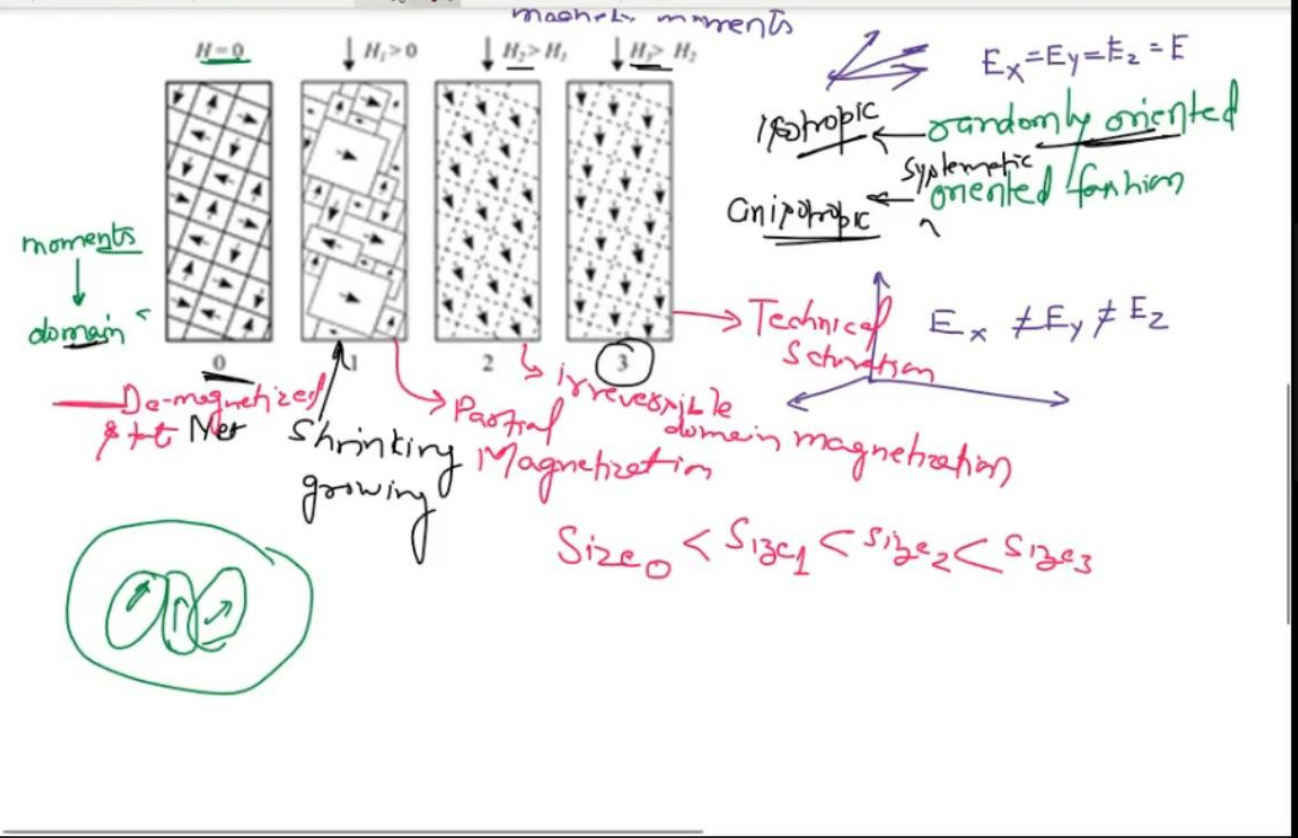

D

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31:58 1:03:36

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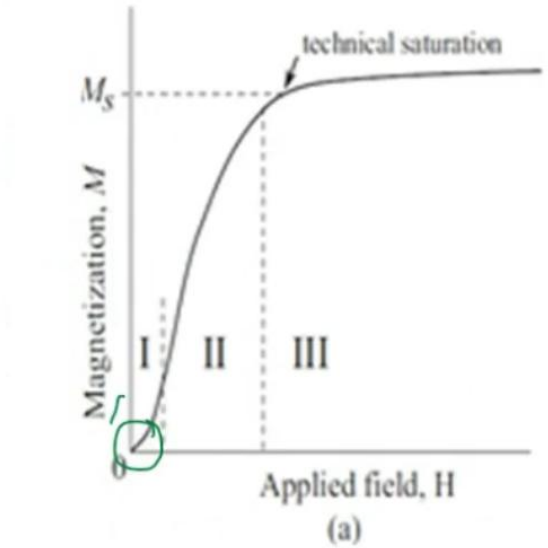
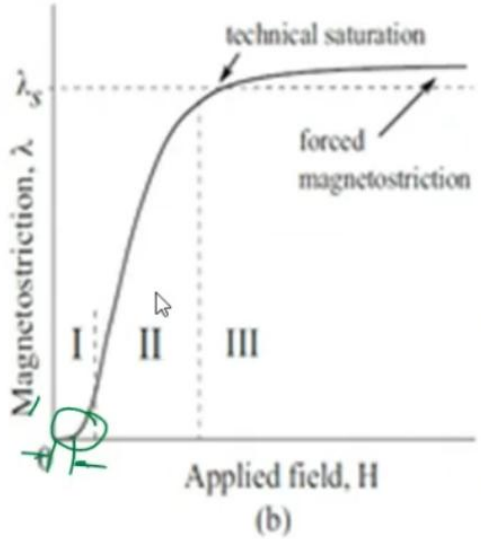
growing

$Size_0 < Size_1 < Size_2 < Size_3$





D

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38:36 1:03:36

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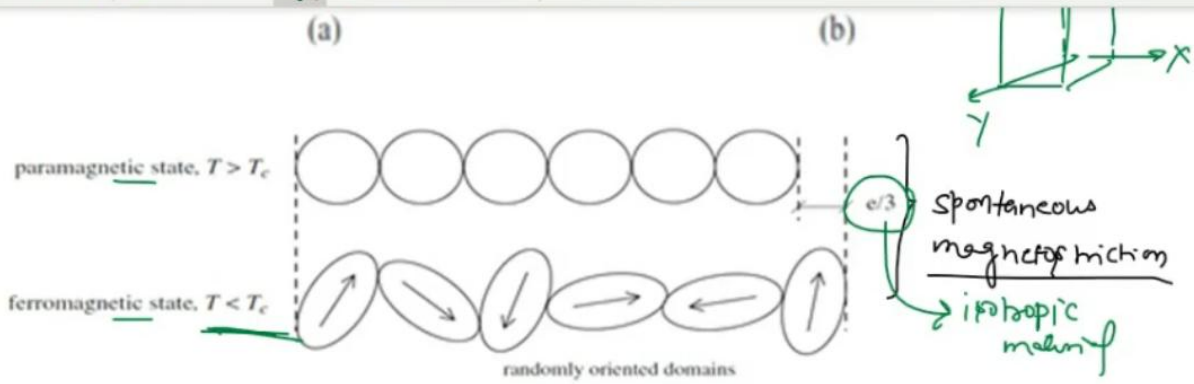

Field induced magneto-striction

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paramagnetic state, $T > T_c$

ferromagnetic state, $T < T_c$

randomly oriented domains

e/3

Spontaneous magnetostriction

isotropic material

Field induced magneto-striction

T_c 633

T 700° c

randomly oriented domains

$H = 0$

$H > 0$

aligned domains

Δl

ferro-magnetic like behaviour

Total M = S.M + F.I.M

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49:18 1:03:36

25°C Haze

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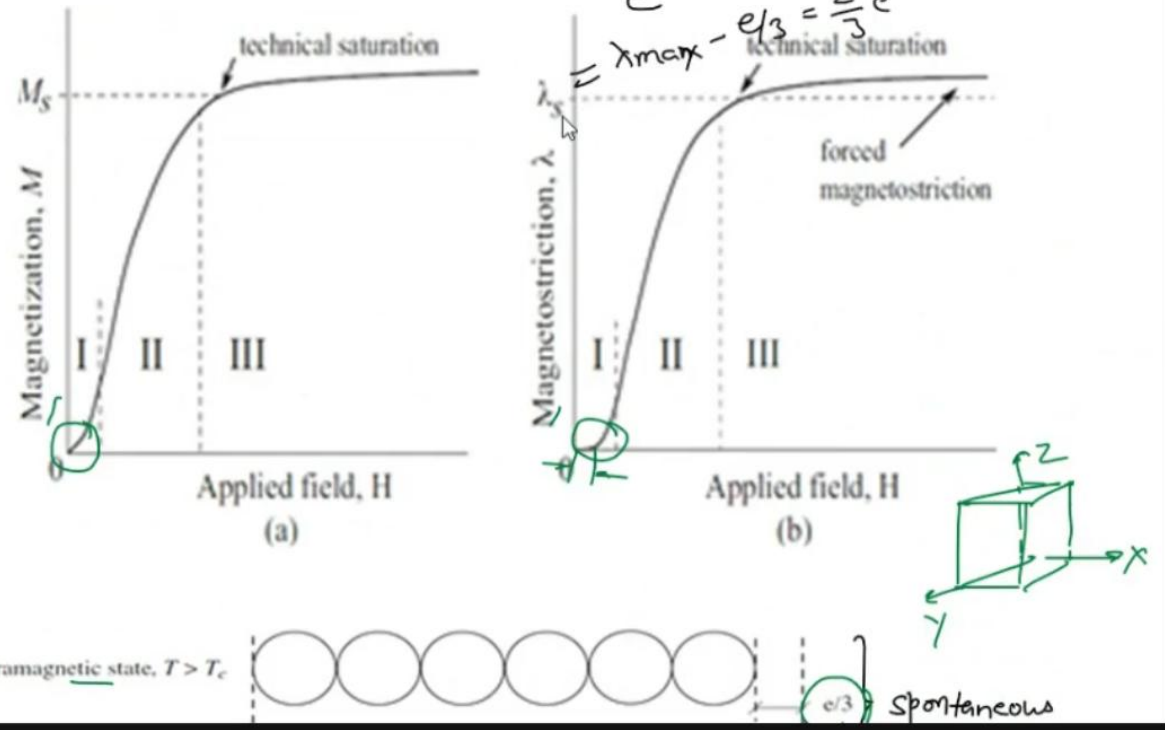

D

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50:54 1:03:36

100%

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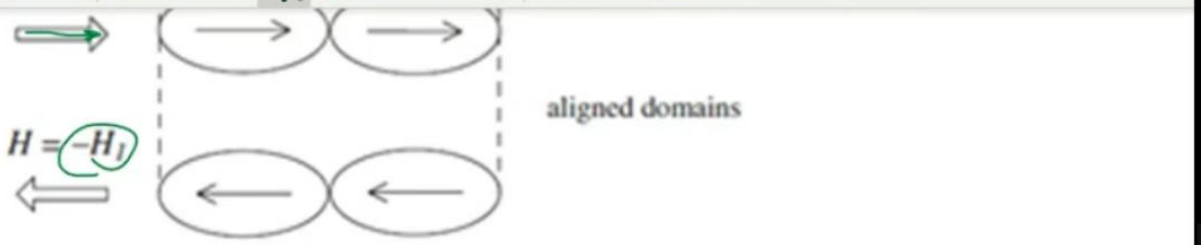

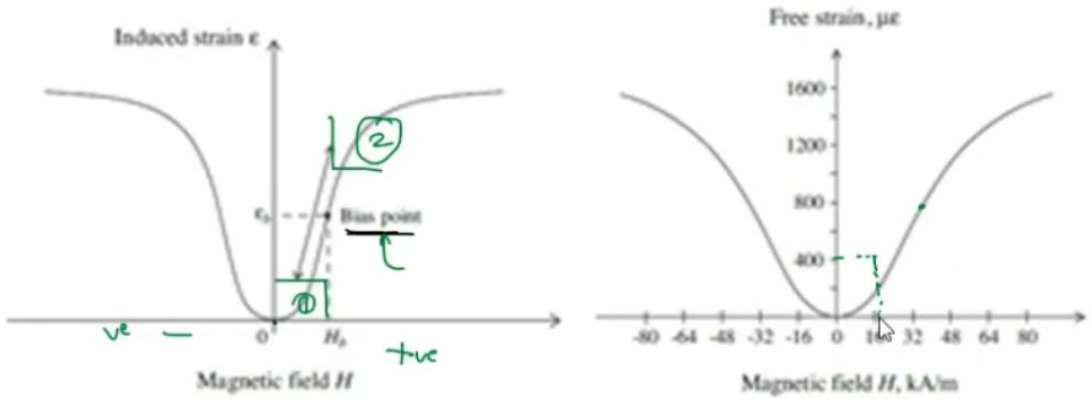

(a) Schematic of strain response

(b) Typical values for Terfenol-D

D

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57:08 1:03:36

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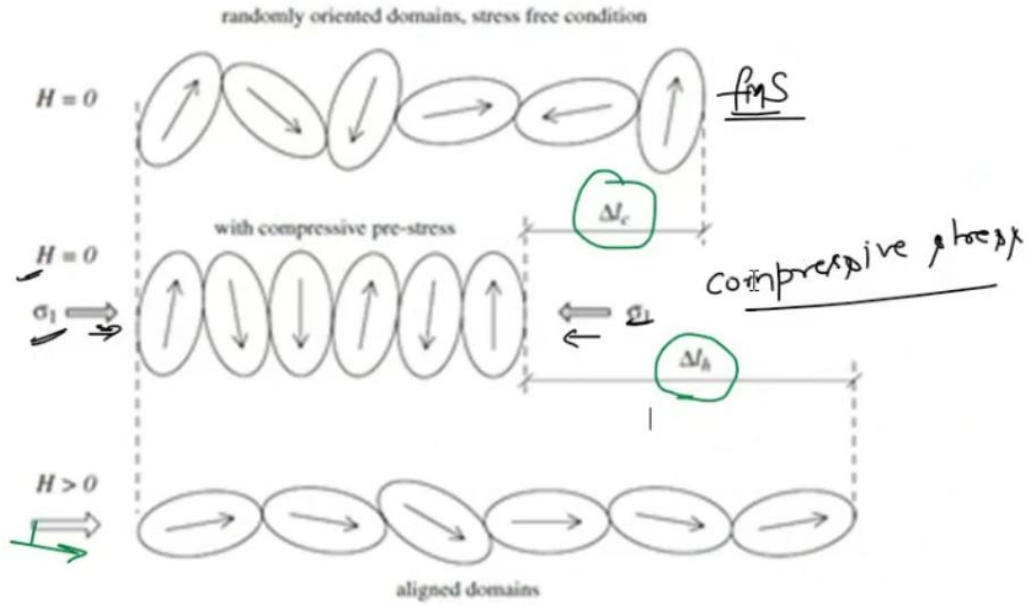

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1:01:50 1:03:36

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26°C Haze

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