

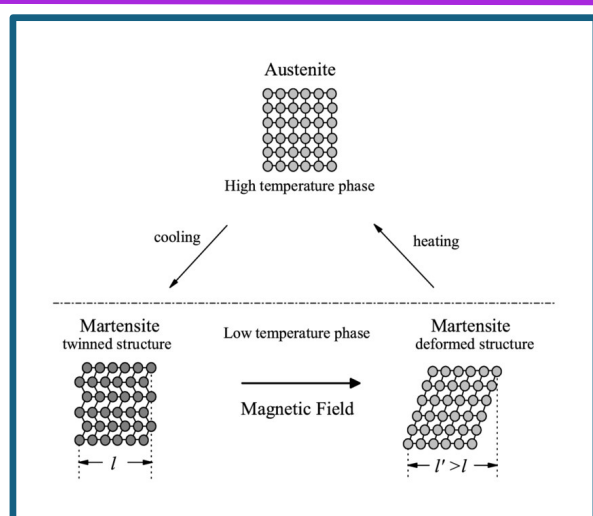


Giornata Internazionale delle Donne nella Scienza IMEM Edition

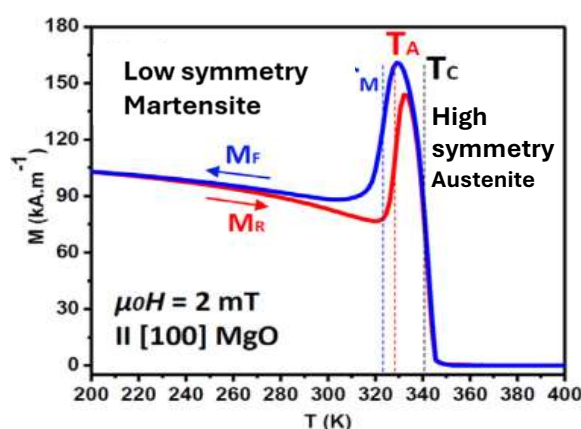
11 febbraio 2025

NAMRATA PATTANAYAK

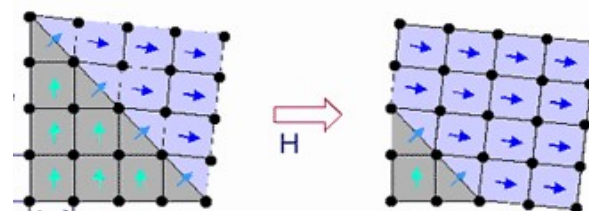
Magnetic Shape Memory Alloys for Advance Functional Devices



Ni-Mn-Ga Heusler Alloy

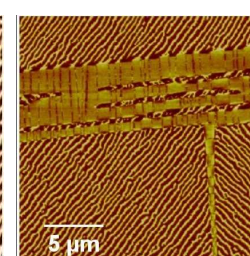
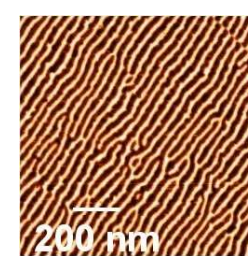
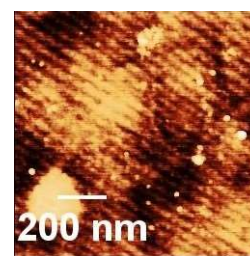
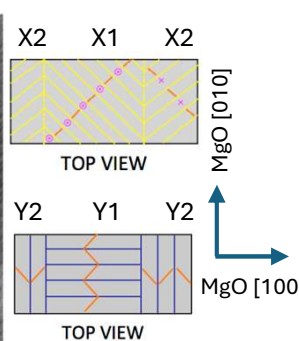
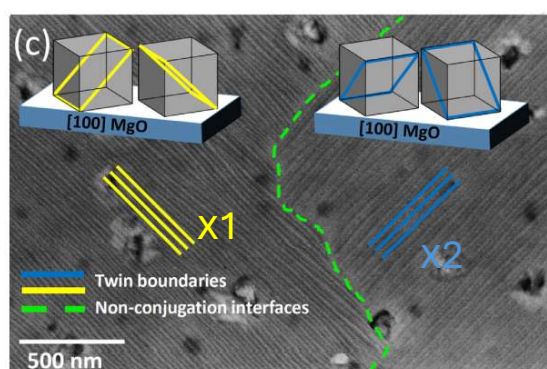
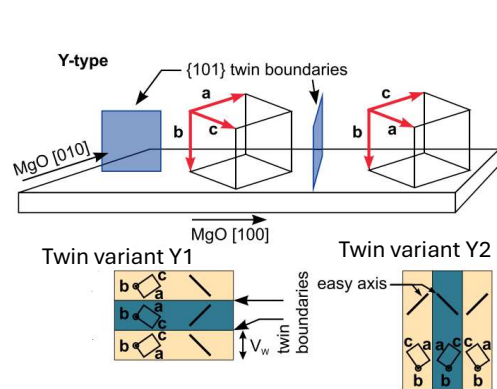


- Tunable Functional Properties.
- Giant Magnetocaloric effect.
- Strong spin-lattice coupling.
- Thin films of **MSMA** are potential candidate for **MEMS** devices.



Magnetic Field Induced Strain > 12% in SC

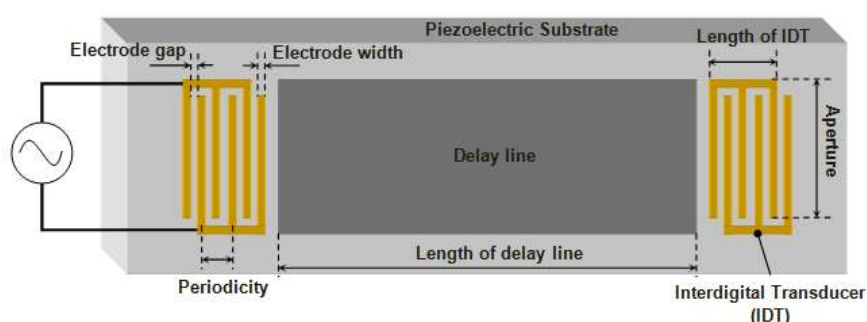
Martensitic Twin Variants and Magnetic Domains in Epitaxial Ni-Mn-Ga films



- X, Y, or mixed X/Y twin variants depends on growth condition and post growth treatments.
- Different domain patterns for the X and Y type twin variants.

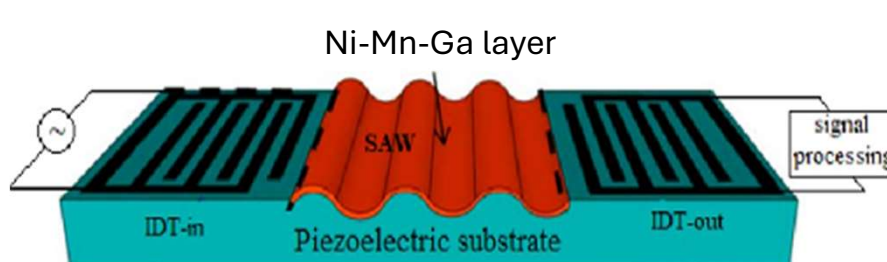
Integration of Surface Acoustic Wave (SAW) technology with MSMA

Schematic of a conventional SAW device



External physical factors (e.g., temperature, strain) alter the frequency, phase, or amplitude of the surface acoustic wave.

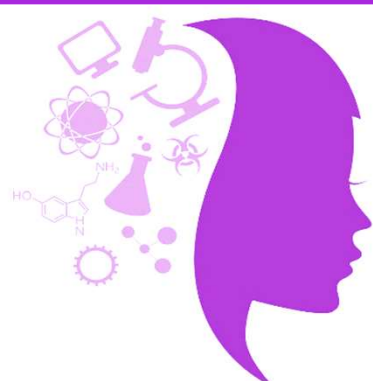
MSMA-Based SAW device



- ✓ High sensitivity
- ✓ Low power consumption
- ✓ Multifunctionality (strain, magnetic field and temperature sensor)

References

1. Acta Materialia 187, 135145, (2020).
2. Applied Materials Today 23, 101058, (2021).
3. Appl. Phys. Lett. 109, 132405 (2016).
4. MoRe-SPIN (2023–2025). Tailoring magneto-electric and magneto-elastic couplings in artificial heterostructures for multifunctional devices and reconfigurable sensors. PRIN 2022, IMEM Head: F. Casoli.



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