

Title: Ferroelectric 2D semiconductors

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Abstract:

This work investigates the ferroelectric properties of γ - In_2Se_3 , a material that uniquely retains its spontaneous polarization at the nano-scale, making it resistant to depolarizing fields. With a direct band gap of 1.8 eV and the ability to switch between insulating and semiconducting phases at room temperature, γ - In_2Se_3 holds promise for next-gen memory devices, where its stable ferroelectricity could revolutionize data storage and processing.



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Ferroelectric 2D semiconductors

Costanza Pennaforti

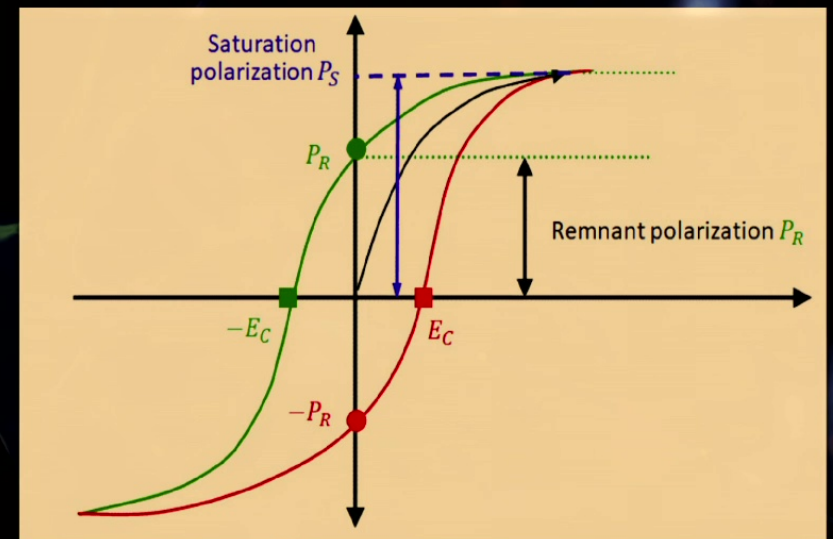
Amalia Patane'

Nada Alghofaili

Nano Ferroelectrics

- Centro-symmetry breaking
- $N \geq 2$ spontaneous states of the polarization, \underline{P} \longrightarrow **Multiple Logic states**
- \underline{P} adjusted with an electric field, \underline{E}

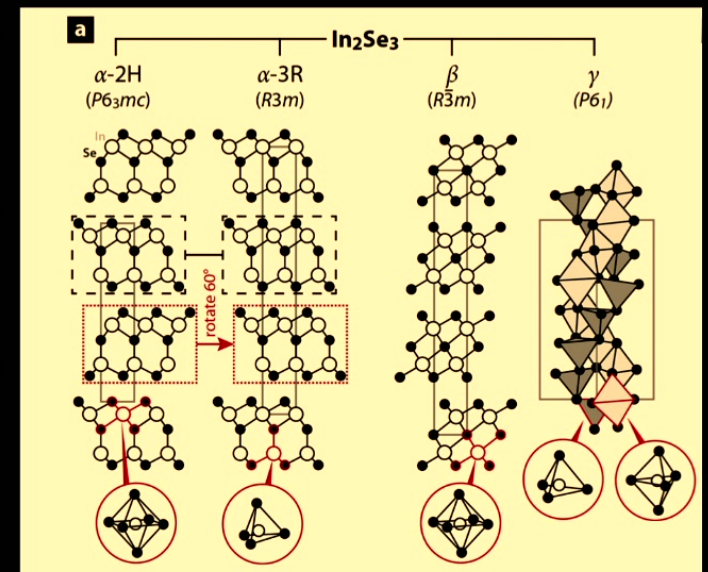
Synaptic learning



- Variety of **polymorphs** (phases): α , β , γ , ... with different properties
- Semiconductor
- FeRAM, Neuromorphic memory, PRAM



In_2Se_3



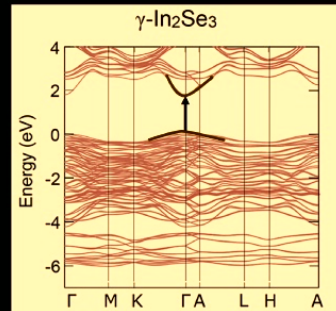
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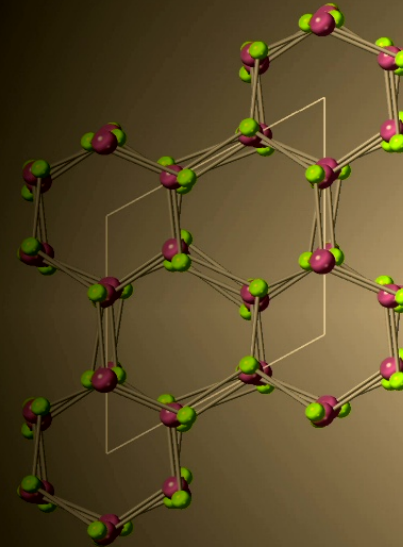
Non-volatile memory and fast processing in a single nano-device

γ phase

- Direct bandgap semiconductor
- Ferroelectric \rightarrow **FeRAM**
- Inter-phase \rightarrow **PRAM** transitions



- In
- Se





Thank you
