

Highly efficient spintronics devices using anti-perovskite transition metal nitrides



Keywords: iron nitride, spin-current, thermoelectric conversion, logic operation

Shinji Isogami

Spin Physics Group

ISOGAMI.Shinji@nims.go.jp

http://www.nims.go.jp/mmu/index_j.html



Background

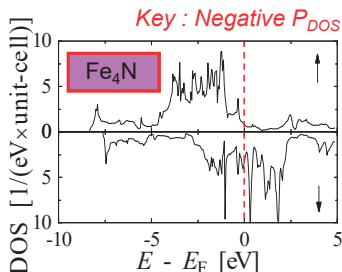
- Requirement of rare metal such as Pt free spintronics devices
- Decrease in power consumption and energy harvesting
- Novel electronic devices for IoT society

Aim

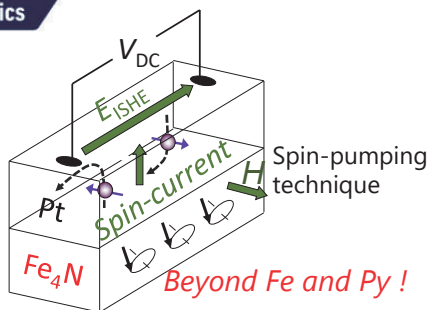
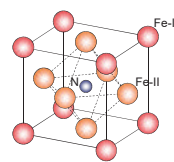
- Enhanced spin-current generation by spin-pumping technique
- High anomalous Nernst coefficient and investigation of crystal orientation
- Logic gate using inverse magnetoresistance devices

Magnetic & Spintronic Materials

Advanced Research Topics

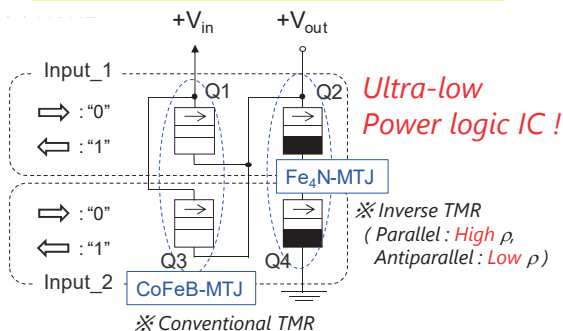
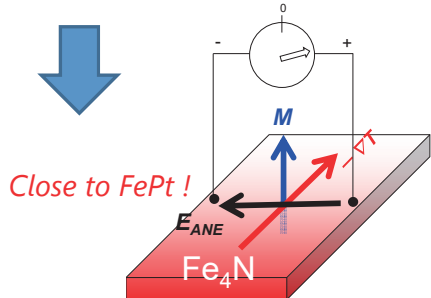


Anti-perovskite type



DOS (left) and γ' -Fe₄N unit cell (right)

Efficient spin-current generation



High anomalous Nernst output source

Publications

- S. Isogami, et al., Appl. Phys. Express 10, 073005 (2017).
- S. Isogami, et al., Jpn. J. Appl. Phys. 55, 043001 (2016).
- S. Isogami, et al., Appl. Phys. Express 6, 063004 (2013).

Logical operation (NOR)

Summary

- Lowering magnetic switching barrier by spin-current \rightarrow magnetic memories and sensors
- Rare earth free thermoelectric conversion
- Novel electronics device with simple architecture

Research outcome

- Enhanced spin-orbit interaction by doping to nitrides
- Improvement of degree of order for N atoms