

# Room-temperature current-induced magnetic switching and spintronic terahertz emission in all-vdW ferromagnetic heterostructure

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## Abstract

Recent breakthroughs in two-dimensional (2D) ferromagnetic van der Waals (vdW) heterostructures have unlocked new potentials for spintronic applications. However, low-temperature ferromagnetic order due to the dimensional effect prohibits their widespread application. Here, we successfully fabricated wafer-scale two-dimensional ferromagnetic material  $\text{Fe}_3\text{GeTe}_2$  by MBE, and the ferromagnetism of  $\text{Fe}_3\text{GeTe}_2$  was significantly enhanced above room temperature by interfacial interaction [1] [2]. In an all-vdW heterostructure of  $\text{Fe}_3\text{GeTe}_2/\text{Bi}_2\text{Te}_3$ , we achieved a robust room-temperature spin-orbit torque (SOT) switching with lower power consumption [3]. Furthermore, we demonstrate the generation and optical detection of terahertz (THz) spin currents, setting a precedent for ultrafast THz spintronics [4]. Our work paves the way for advanced, high-speed spintronic devices designed for the challenges of modern electronics.

## References

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