

What Role Can 2D Materials and Topological Semimetals Play in Future Electronics?

Eric Pop

*Electrical Engineering, Applied Physics, Materials Science & Engineering, SystemX Alliance, SLAC
Stanford University, Stanford CA 94305, U.S.A. Contact: epop@stanford.edu*

I will discuss whether 2D semiconductors and topological semimetals could play a role in future electronics. Their ultrathin nature provides some advantages for flexible electronics [1], light-weight solar cells [2], nanoscale transistors [3], and interconnects [4], but they are not ideal where conventional materials work sufficiently well. I will dive deeper into monolayer 2D semiconductors as energy-efficient transistors [5-8], discuss the effects of strain on their operation [8,9], and outline fundamental challenges that remain. I will also describe ultrathin chalcogenides for phase-change memory [10] and ultrathin topological semimetals as future interconnects [4]. If time permits, I will discuss potential thermal management advances using 2D materials [12,13] and nitrides with good thermal conductivity [14]. Combined, these studies reveal some fundamental limits and practical applications of emerging materials for future electronics.

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