

Power spintronics: Producing AC voltages by manipulating magnetic fields

EurekAlert!

Scientists are putting a new spin on their approach to generating electrical current by harnessing a recently identified electromotive force known as spinmotive force, which is related to the field of spintronics that addresses such challenges as improving data storage in computers. Now, a novel application of spintronics is the highly efficient and direct conversion of magnetic energy to electric voltage by using magnetic nanostructures and manipulating the dynamics of magnetization. According to a report published in the American Institute of Physics' (AIP) journal Applied Physics Letters, this conversion could be the foundation for future development of spin-based power electronics, a field the authors call "power spintronics." Their newly published results of an experimental model suggest that a power spintronics-based device may one day be a promising approach to obtaining alternating current (AC) voltages from direct current (DC) magnetic fields. The researchers demonstrated for the first time the feasibility of a device that generates a voltage based on manipulating an effective magnetic field within a nanowire that arises from width modulation. Technically such a field is not a true magnetic field, but it can be viewed as such. The team tested a one-dimensional model. It showed that DC magnetic field characteristics such as magnitude, and design parameters such as wire width, can be used to control, or "tune," the frequency and amplitude of AC current. Importantly, their results showed that a variable frequency ranging from megahertz to gigahertz can be achieved. Control and range in tuning ability are highly desirable management features in generating current. The team's results suggest that applying their spintronics approach may one day meet a variety of commercial energy demands due to control and scalability.

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