Paper ID: 39993
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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialised Technologies, Including Nanotechnology (8)

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SPINTRONICS: TOWARDS MORE EFFICIENT SENSING AND STORAGE DEVICES

Abstract

Components used on spacecraft need to meet several criteria, including small size, low power use and capability to withstand the harsh environment of space. Meeting these requirements while improving performance is becoming a challenge in electronic devices, which form the cornerstone for sensing the spacecraft's environment, and processing data on-board.

For many years, physicists have been working on spintronics [1-4], an area of nanotechnology enabled by advances in material preparation. Unlike traditional electronics which focus on the charge of electrons for coding information, spintronic devices use both the charge of electrons and their spin. In the past few years, better understanding of the underlying physics of spintronic devices has led to proposals for various devices for sensing, logic and storage [4-9] with low power use, resilience to extreme environmental conditions (such as temperature changes, and radiation) and nanoscale size. These properties make spintronic devices suitable replacements for many electronic components in use in space.

In this paper, we provide an overview of the field of spintronics, discussing the physical basis for some of the spintronic devices already on the market (such as the MRAM) which show potential for use in space. Special focus is given on understanding the environmental resilience of these devices, and areas of application they could be used in (including data storage and enabling new computing architectures).

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