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| **Abstract:** |  |
| Abstract— Spintronic, also termed spin electronics or spin transport electronics, is a kind of new technology, which exploits the two fundamental degrees of freedom- spin-state and charge-state of electrons to enhance the operational speed for the data storage and transfer efficiency of the device. Thus, it seems an encouraging technology to combat most of the prevailing complications in orthodox electron-based devices. This novel technology possesses the capacity to mix the semiconductor microelectronics and magnetic devices’ functionalities into one integrated circuit. Traditional semiconductor microelectronic devices use only the electronic charge to process the information based on binary numbers, 0 and 1. Due to the incessant shrinking of the transistor size, we are reaching the final limit of 1 nm or so. At this stage, the fabrication and other device operational processes will become challenging as the quantum effect comes into play. In this situation, we should find an alternative future technology, and spintronic may be such technology to transfer and store information. This review article provides a detailed discussion of the spintronic technology: fundamentals, materials, devices, circuits, challenges, and current research trends. At first, the fundamentals of spintronic technology are discussed. Then types, properties, and other issues of the spintronic materials are presented. After that, fabrication and working principles, as well as application areas and advantages/disadvantages of spintronic devices and circuits, are explained. Finally, the current challenges, current research areas, and prospects of spintronic technology are highlighted. This is a new paradigm of electronic cum magnetic devices built on the charge and spin of the electrons. Modern engineering and technological advances in search of new materials for this technology give us hope that this would be a very optimistic technology in the upcoming days. | |