

Seminar : Guoping Zhao

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Research developments in micromagnetics for topological spin structures

Abstract

Information technology based on topological spin structures such as skyrmions enables read-and-write operations through electric currents, bridging the gap between electronic information and the spin. It possesses a series of advantages, including high speed, non-volatility, and low energy consumption. This technology holds significant application prospects in magnetic storage, logic operations, quantum computers, and even defense and military domains. Micromagnetics serves as the primary theoretical approach to study topological spin structures. It allows analysis of the generation and manipulation of such structures, prediction of novel topological magnetic configurations, and the design of related devices. This report is based on the recent research achievements of our group, providing a classification of the main research approaches in micromagnetics. Additionally, it presents a comprehensive review of the major advancements in the study of topological spin structures, covering various materials such as ferromagnetic, antiferromagnetic, ferrimagnetic, synthetic antiferromagnetic, and frustrated materials, while also addressing some key challenges and offering prospects for future developments.



Guoping Zhao received the B.S. and the Ph.D. Degrees of Physics in 1990 and 2003, respectively, from University of Science and Technology of China and National University of Singapore (NUS). He worked in NUS from 2000 to 2004. Since 2004, he has been a professor and distinguished professor in Sichuan normal University (SICNU). Professor Zhao is the leader of the Scientific Research Innovation Team for Physics and the founder and director of the Magnetic Materials Lab, SICNU. He is the author or the coauthor of more than 100 SCI papers published in international journals and referred conferences, including more than 50 on ferromagnetic and antiferromagnetic skyrmion dynamics.

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