Topological spintronics and its device applications

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Recently, tremendous attention has been focused on the continuous scaling of Moore's law as well as the advanced non-von Neumann computing architecture. Spintronics may go beyond classical electronics and offer low power logic/computing components to further increase the performance of modern information and communication technologies meanwhile reducing the energy consumption. In particular, magnetic skyrmions – topologically non-trivial spin nanostructures, have been endowed with great expectations as promising candidates for next-generation spintronic device applications. However, there is a major roadblock for skyrmionics device applications – the skyrmion Hall effects, which may lead to skyrmions annihilation at the sample edge. In this talk, Dr. Yan Zhou will discuss his recent work of eliminating/suppressing the skyrmion Hall effects, which may overcome the main bottleneck of practical applications of skyrmionic racetrack memory and logic devices. In the last part of his talk, he will discuss some novel device concepts based on these intriguing topological spin textures (such as neuromorphic or skyrmionics computing etc).

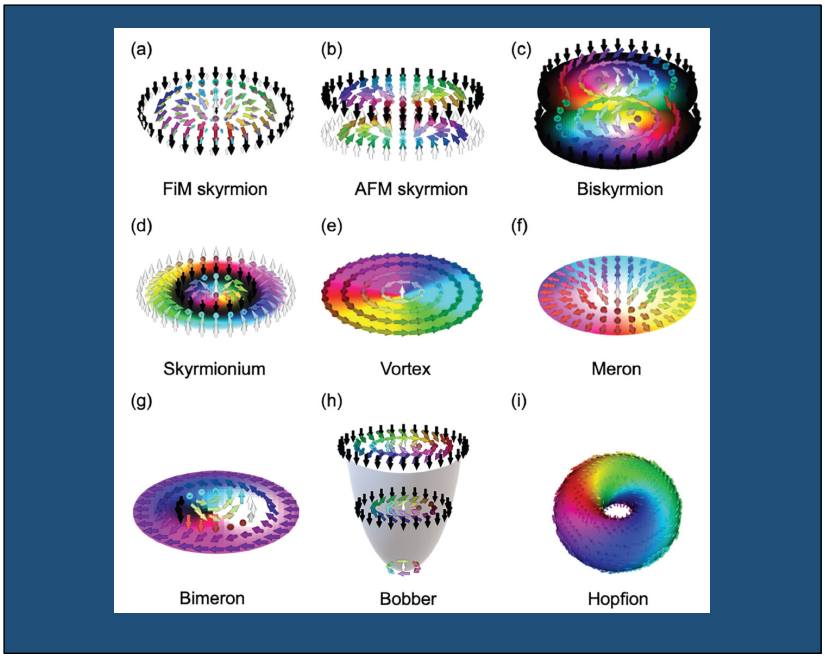

Figure 1. Illustrations of different 2D and 3D topologically non-trivial spin textures [1].

References

[1] Y. Zhou, S. Li, X. Liang, Y. Zhou*, *Advanced Materials* 2025, 37, 2312935.