

# Domain walls in helical magnets

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The structure of domain walls determines to a large extent the properties of magnetic materials, in particular their hardness and switching behavior, it represents an essential ingredient of spintronics. Common domain walls are of Bloch and Néel types in which the magnetization rotates around a fixed axis, giving rise to a one-dimensional magnetization profile.

Domain walls in helical magnets, most relevant in multiferroics, were never studied systematically.

Here we show that domain walls in helical magnets are fundamentally different from Bloch and Néel walls.

They are generically characterized by a two-dimensional pattern formed by a regular lattice of vortex singularities.

In conical phases vortices carry Berry phase flux giving rise to the anomalous Hall effect.

In multiferroics vortices are charged, allowing to manipulate magnetic domain walls by electric fields.

Our theory allows the interpretation of magnetic textures observed in helical magnetic structures.