Topological Structures in Ferroic Materials as Nanoscale Functional Elements

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Domain walls in complex oxides have recently received increased attention due to the fact that their properties, which are linked to the inherent order parameters of the material, its structure and symmetry, can be completely different from that of the parent bulk material [1]. I will present an overview of recent results regarding new intrinsic properties of multiferroic phase boundaries, domain walls, and other topological defects in multiferroic materials [2, 3, 4]. The origin and nature of the observed confined nanoscale properties are probed using a combination of nanoscale transport measurements based on scanning probe methods, high resolution transmission electron microscopy and first-principles density functional theory. I will also give an outlook on how these special properties can be found in other material systems and discuss possible future applications of domain walls as nanoscale functional elements [5].

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