

Catalogue of Altermagnetism in Magnetic Wallpaper and Space Groups

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Altermagnetism, characterized by compensated collinear spin alignment, exhibits identical spin states at opposite momenta. In conventional altermagnets, these identical spin states are typically linked by inversion symmetry, restricting most candidates to centrosymmetric crystals. Here, we introduce a non-spatial global symmetry that can effectively replace inversion symmetry in preserving spin-state equivalence. Using this concept, we perform an exhaustive symmetry-based classification to determine which magnetic wallpaper groups and magnetic space groups can host altermagnetic order. In other words, for each wallpaper or space group, we answer whether it can realize altermagnetism and, if so, enumerate all possible types of altermagnetic orders shown in Brillouin zones permitted by its symmetry. This comprehensive catalogue establishes a unified symmetry foundation for altermagnetism across all magnetic groups, paving the way for the discovery of new material platforms and physical phenomena.