

OPTICAL CONTROL OF TOPOLOGICAL MEMORY BASED ON ORBITAL MAGNETIZATION

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Under suitable conditions, some twisted graphene multilayers and transition-metal dichalcogenides become Chern insulators, exhibiting the anomalous quantum Hall effect and orbital magnetization due to spontaneous valley polarization. We study the interaction of a Chern insulator with circularly polarized light. The interaction energy contains an antisymmetric term that couples to the helicity of incident light. For a two-band Chern insulator, this term is expressed as an integral involving the Berry curvature of the system. Taking advantage of this interaction, we propose an experimental protocol for switching topological memory based on orbital magnetization by circularly polarized light [1]. The sign of the topological memory is manifested experimentally as the sign of the spontaneous quantum Hall effect. Moreover, two laser beams of opposite circular polarization can nucleate domains of opposite magnetization and thus produce an optically configurable domain wall carrying topologically protected chiral edge modes. This framework is also applicable to the kagome material KV_3Sb_5 , where the time-reversal symmetry is spontaneously broken by three coexisting charge-density waves. Using the same formalism, we also show that circular shaking of an optical lattice can induce a controlled direct current of bosonic atoms loaded into the lattice [2], which is similar to the circular photogalvanic effect.

[1] Sergey S. Pershoguba and Victor M. Yakovenko, “Optical control of topological memory based on orbital magnetization”, [Phys. Rev. B **105**, 064423 \(2022\)](#), [arXiv:2106.01192](#)

[2] Sergey S. Pershoguba and Victor M. Yakovenko, “DC current in a circularly shaking optical lattice”, [arXiv:2205.15981](#)

