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Anomalous hall phases in a bosonic Mott insulator CLEMENT WONG, REMBERT DUINE, Utrecht University — Spin-orbit coupled systems that break time-reversal symmetry can exhibit the anomalous hall phase, which support a hall conductivity in the absence of a magnetic field. These topological phases are in a sense the building blocks of topological insulators and bears similarities to chiral topological superconductors. Recently, it has become possible to engineer spin-orbit couplings in cold atomic systems, making it possible to study these systems in the strongly interacting regime, for bosons and fermions. With these motivations, we study spin-orbit coupled bosons in an optical lattice in the Mott-insulating phase using a strong-coupling perturbation theory. We show that quite generally, strong interactions can induce an anomalous Hall phase even for a topologically trivial spin-orbit coupling. For the spin orbit coupling in experiment Lin et. al. [Nature (London) 471, 83 (2011)], we compute the quasiparticle dispersions, spectral weights, renormalized momentum space texture and the associated interaction-generated Berry curvature. Our results have implications for the Mott-insulating phases with textured magnetic order.

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