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Magnetic Susceptibility and Quantum Oscillations in a Buckled Honeycomb Lattice CALVIN TABERT, University of Guelph, JULES CARBOTTE, McMaster University, ELISABETH NICOL, University of Guelph — We calculate the magnetic response of a low-buckled honeycomb lattice with intrinsic spin-orbit coupling which is described by the Kane-Mele Hamiltonian (a model which would describe the low-energy physics of a material like silicene). Included in the Hamiltonian, is a sublattice potential difference term which may be induced by a perpendicular electric field; this field can tune the system from a topological insulator (TI), through a valley-spin polarized metal, to a trivial band insulator (BI). In an external magnetic field, a distinct signature of the phase transition is seen in the derivative of the magnetization with respect to chemical potential; this gives the quantization of the Hall plateaus through the Streda relation. The results are compared with the zero-frequency conductivity obtained from the Kubo formula. The magnetic susceptibility also displays signatures of the different topological phases. We also explore the de-Haas van-Alphen effect. At the transition point between the TI and BI, magnetic oscillations exist for any value of chemical potential. Away from the critical point, the chemical potential must be larger than the minimum gap. For large chemical potential (or small but finite sublattice potential difference), there is a strong beating pattern.

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