Quantum anomalous Hall insulator in ionic Rashba lattice of correlated electrons

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We propose an exactly solvable two-dimensional lattice model of strongly correlated electrons that realizes a quantum anomalous Hall insulator with Chern number $\mathcal{C} = 1$. We show that the interplay of ionic potential, Rashba spin-orbit coupling and Zeeman splitting leads to the appearance of quantum anomalous Hall effect. Moreover, we calculate in an exact manner Chern number for the correlated system where electron-electron interactions are introduced in the spirit of Hatsugai-Kohmoto model using two complementary methods, one relying on the properties of many-body groundstate and the other utilizing single-particle Green's function, and subsequently we determine stability regions. By leveraging the presence of inversion symmetry we find boundaries between topological and trivial phases on the analytical ground. Notably, we show that in the presence of correlations onset of topological phase is no longer signalled by a spectral gap closing. We provide a clear understanding of this inherently many-body feature by pinpointing that the lowest energy excited states in the correlated system are no longer of the single-particle nature and thus are not captured by a spectral function.

[1] M. M. Wysokiński, W. Brzezicki *arXiv:2303.04454* (2023)