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Quantum Anomalous Hall Effect in Low-buckled Honeycomb Lattice with In-plane Magnetization YAFEI REN[1], University of Science and Technology of China, HUI PAN, FEI YANG, XIN LI, Beihang University, ZHENHUA QIAO, University of Science and Technology of China, ZHENHUA QIAO'S GROUP TEAM, HUI PAN'S GROUP TEAM — With out-of-plane magnetization, the quantum anomalous Hall effect has been extensively studied in quantum wells and two-dimensional atomic crystal layers [1]. Here, we investigate the possibility of realizing quantum anomalous Hall effect (QAHE) in honeycomb lattices with in-plane magnetization. We show that the QAHE can only occur in low-buckled honeycomb lattice where both intrinsic and intrinsic Rashba spin-orbit coupling appear spontaneously. The extrinsic Rashba spin-orbit coupling is detrimental to this phase. In contrast to the out-of-plane magnetization induced QAHE, the QAHE from in-plane magnetization is achieved in the vicinity of the time reversal symmetric momenta at M points rather than Dirac points. In monolayer case, the QAHE can be characterized by Chern number $\mathcal{C} = \pm\infty$ whereas additional phases with Chern number $\mathcal{C} = \pm\in$ appear in chiral stacked bilayer system. The Chern number strongly depends on the orientation of the magnetization. The bilayer system also provides additional tunability via out-of-plane electric field, which can reduce the critical magnetization strength required to induce QAHE. It can also lead to topological phase transitions from $\mathcal{C} = \pm\in$ to ±1 and finally to 0. [1] Review article: arXiv:1509.09016

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