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Electric field induced quantum anomalous Hall effect in two-dimensional antiferromagnetic triphenyl-lead lattice HYUN-JUNG KIM, Korea Inst for Advanced Study, CHAOKAI LI, International Center for Quantum Materials, Peking University, JI FENG, Peking University, ZHENYU ZHANG, University of Science and Technology of China, JUN-HYUNG CHO, Hanyang University — The tuning of topological states is of significant fundamental and practical importance in contemporary condensed matter physics, for which the extension to two-dimensional (2D) organometallic systems is particularly attractive.[1] Using first-principles calculations, we find that a 2D hexagonal triphenyl-lead lattice composed of only main group elements is susceptible to a magnetic instability, characterized by a antiferromagnetic (AFM) insulating state with a renormalized valley gaps with gap difference of 24 meV due to the spin and valley coupling. This AFM state will be subject to a anomalous valley Hall effect under the action of Berry curvature-induced spin and valley currents via, for example, injection of circularly polarized light.[2] Furthermore, such a AFM band insulator can be tuned into a topologically nontrivial quantum anomalous Hall state with a Chern number of one by the application of an out-of-plane electric field. These findings further enrich our understanding of 2D hexagonal organometallic lattices for potential applications in spintronics and valleytronics. [1] M Z. F. Wang, Z. Liu, and F. Liu, Nat. Comm. 4, 1471 (2013) [2] X. Li, T. Cao, Q. Niu, J. Shi, and J. Feng, Proc. Natl. Acad. Sci. 110, 2738 (2012)

Hyun-Jung Kim
Korea Inst for Advanced Study

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