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**Weyl Ferroelectric Semimetal** HONGMING WENG, Chinese Academy of Sciences, RONGHAN LIANG, Chinese Academy of Science, YUANFENG XU, Chinese Academy of Sciences, JIANGANG HE, University of Vienna, SAMI ULLAH, JIANGXIU LI, Chinese Academy of Science, JUNMING LIU, Nanjing University, DIANZHONG LI, Chinese Academy of Science, CESARE FRANCHINI, University of Vienna, XING-QIU CHEN, Chinese Academy of Science — The recent discoveries of ferroelectric metal and Weyl semimetal (WSM) have stimulated a natural question: whether these two exotic states of matter can coexist in a single material or not. These two discoveries ensure us that physically it is possible since both of them share the same necessary condition, the broken inversion symmetry. By using first-principles calculations, we demonstrate that the experimentally synthesized nonmagnetic $HgPbO_3$ is such a hybrid "Weyl ferroelectric semimetal. Its centrosymmetric $R\bar{3}c$ phase will undergo a ferroelectric phase transition to the ferroelectric $R3c$ structure. Both phases are metallic. Most importantly, it also harbors six pairs of chiral Weyl nodes around the Fermi level to be an oxide WSM. The coexistence of ferroelectricity and Weyl nodes in $HgPbO_3$ is an ideal platform for exploring multiphase interaction and mutual control. The Weyl nodes can be tuned by temperature or external pulse electric field, which is promising for potential applications.

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None

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