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Direct Observation of Chiral Topological Solitons in 1D Charge-Density Waves TAE-HWAN KIM, Pohang University of Science and Technology (POSTECH), SANGMO CHEON, SUNG-HOON LEE, Institute for Basic Science (IBS), HAN WOONG YEOM, IBS and POSTECH — Macroscopic and classical solitons are easily and ubiquitously found, from tsunami to blood pressure pulses, but those in microscopic scale are hard to observe. While the existence of such topological solitons were predicted theoretically and evidenced indirectly by the transport and infrared spectroscopy measurements, the direct observation has been hampered by their high mobility and small dimension. In this talk, we show direct observation of topological solitons in the quasi-1D charge-density wave (CDW) ground state of indium atomic wires, which are consisting of interacting double Peierls chains. Such solitons exhibit a characteristic spatial variation of the CDW amplitudes as expected from the electronic structure. Furthermore, these solitons have an exotic hidden topology originated by topologically different 4-fold degenerate CDW ground states. Their exotic topology leads to the chirality of 1D topological solitons through interaction between two solitons in the double Peierls chains. Detailed scanning tunneling microscopy and spectroscopy reveal their chiral nature at the atomic scale. This work paves the avenue toward the microscopic exploitation of the peculiar properties of nanoscale chiral solitons.

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