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Reversible Resistive Switching in (La,Pr,Ca)MnO_3; Cryogenic nonvolatile RAM HEE TAEK YI, Department of Electrical and Computer Engineering, Rutgers University, TAEKJIB CHOI, Department of Physics, Rutgers University, SANG-WOOK CHEONG, Department of Physics, Rutgers Univeristy, RUTGERS CENTER FOR EMERGENT MATERIALS TEAM — Cryogenic-temperature electronics technologies are a practical promise for continuing demand for high performance electronics. By utilizing the unique hysteretic behavior of perovskite (La,Pr,Ca)MnO_3 in the variation of temperature and applied electric fields, we have discovered that two electronically-distinct phases, with a huge difference in resistance ($>10^5$), can be repeatedly switched by applying various voltage pulses at cryogenic temperatures (e.g., 2 K), and the magnitude of resistance of each phase is highly stable with time. A multilevel memory effect for storing multiple bits was also found. We believe that the non-volatile cryo-PRAM utilizing our findings is an excellent candidate for memory devices for low-temperature electronic technologies such as quantum computers, Superconducting Rapid Single Flux Quantum (RSFQ) technology, low temperature detectors.

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