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Quantum corrections to the conductivity of epitaxial grown $SrTiO_3$ film on Si DEAN KOEHNE, RYAN COTTIER, DANIEL CURRIE, JOHN MIRACLE, CRAIG SWARTZ, NIKOLETA THEODOROPOULOU, Texas State University — We use low temperature magnetotransport measurements to study the electronic properties of strained, oxygen deficient $SrTiO_3$ (STO) thin films ($d = 8 - 20nm$) grown on semi-insulating p-Si(001) by Oxide Molecular Beam Epitaxy. The resistance is measured using the Van der Pauw technique and shows insulating behaviors. The resistance increases logarithmically from 50 K to 10 K and when a magnetic field is applied perpendicular to the plane the magnetoresistance (MR) is negative. Below 10 K, we observe Mott's Variable Range Hopping for ($d < 15nm$) and a nonmonotonic MR. The results are analyzed using the conventional theories of weak localization (quantum interference of backscattered electrons) and electron-electron interaction corrections to the conductivity in two dimensions providing evidence for quantum confinement. To more precisely measure the transport, we fabricated Hall-bar structures using photolithography and measured the carrier concentration along with the mobility for both configurations. We discuss the effect of strain due to the lattice mismatch between STO and Si (1.7% compressive in-plane strain), oxygen vacancies and disorder on the electronic properties of this 2d system.

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