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Growth and transport properties of fractionally δ-doped oxide superlattices[1] HO NYUNG LEE, WOO SEOK CHOI, Oak Ridge National Laboratory, SUYOUN LEE, Korea Institute of Science and Technology, VALENTINO COOPER, Oak Ridge National Laboratory — $LaTiO_3/SrTiO_3$(LTO/STO) heterostructures are interesting as they show an intriguing 2D conduction, and their bulk counterpart, $La_xSr_{1-x}TiO_3$ (LSTO), exhibits a filling-controlled insulator-metal transition (IMT). In this study, we investigated the filling controlled IMT in 2D geometry by fabricating monolayer-thick fractionally δ–doped LSTO/STO superlattices (SLs), in order to find ways to enhancing the carrier mobility of two dimensional electron gas (2DEG). Fractional layers of LSTO have been grown in between STO using advanced PLD. It is found that the SLs' transport properties are governed by a multichannel conduction with at least two distinctly different carriers: (1) High-density-low-mobility carriers presenting at the LSTO interface layer and (2) low-density-high-mobility carriers residing in the STO layers away from the δ–doped layer. By optimizing x, we could tune the effective mass and carrier density to enhance the carrier mobility by about an order of magnitude, selectively for the high-density-low-mobility carriers. This proves that the fractional δ–doping is an effective way to controlling the filling controlled IMT, resulting in highly improved transport properties

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