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Small band gap insulating state induced by Ionic liquid gating in Sr_2IrO_4 single crystals[1] BOYI YANG, ALLEN GOLDMAN, University of Minnesota — The 5d iridates have attracted much interest due to the prediction of novel electronic phases driven by the interplay of spin-orbit coupling with the on-site Coulomb interaction. The compound Sr_2IrO_4, with a crystal structure similar to that of La_2CuO_4, was identified as a spin-orbital Mott insulator. It has been doped in various ways in search of a possible superconducting state, considering its similarities to the cuprates. We successfully fabricated multiple ionic liquid (DEME-TFSI) gated field effect transistors based on the cleaved ab plane surface of Sr_2IrO_4 single crystals. Due to the insulating behavior of the bulk, the surface sensitive gating effect can be characterized using transport property measurements. Upon hole doping, the in-plane electrical resistivity was observed to follow an activation law, with the band gap decreasing from 130 meV to 0.5 meV. A slight negative magneto-resistance below 5K was identified where the resistivity deviated from activated behavior. The low temperature insulating state will be studied further, and by improving the design of the device, the carrier concentration measured and the latest experimental results will be reported.

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