Chemically doped graphene was used to fabricate n-type and p-type transistors using WSe₂ as the channel material. Benzyl Viologen (BV), a strong electron donor, was used as the n-type dopant allowing graphene to contact the WSe₂ valence band. BV doping graphene was shown to give n-type behavior in WSe₂ that initially showed ambipolar characteristics by increasing (decreasing) electron (hole) current by 1000x and reducing Schottky barrier height. NO₂, an electron acceptor, was used as the p-type dopant for graphene. NO₂ doping was shown to protect the oxidative channel to give degenerate doping of the WSe₂. In both cases the dopants are shown to be air stable.

Device Fabrication

Step 1: Mechanically exfoliate WSe₂ flake and etch using EBL

Step 2: Pattern and deposit oxide for channel protection

Step 3: Dry transfer of graphene flake

Step 4: Etch graphene and evaporate metal contacts

Step 5: Dope with BV/NO₂

References


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