Graphene field effect transistors using TiO_2 as the dielectric layer

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It is very important to find a suitable substrate for graphene electronic devices. In this work, we report the electron mobility and electron density of three graphene field effect transistors using a 280 nm titanium dioxide dielectric layer and a graphene channel of area 300 × 300 μm^2. We achieve electron mobilities up to 1877 cm^2/V and the Dirac point appears in small gate voltages, as compared to similar SiO_2 transistors. Also, we obtain the TiO_2 surface roughness through profilometry and confirm that electron mobility is inversely proportional to the channel's surface roughness.

REFERENCES

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FIGURES

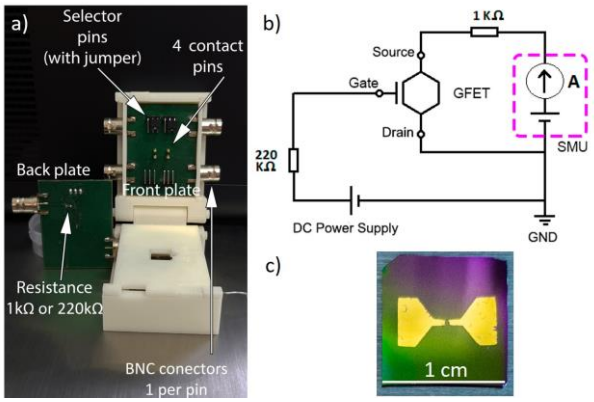

Figure 1: (a) 3D printed mount for the electronic characterization of the GFET. (b) The circuit's diagram. The sample (c) is inserted in the middle of the mount in (a).

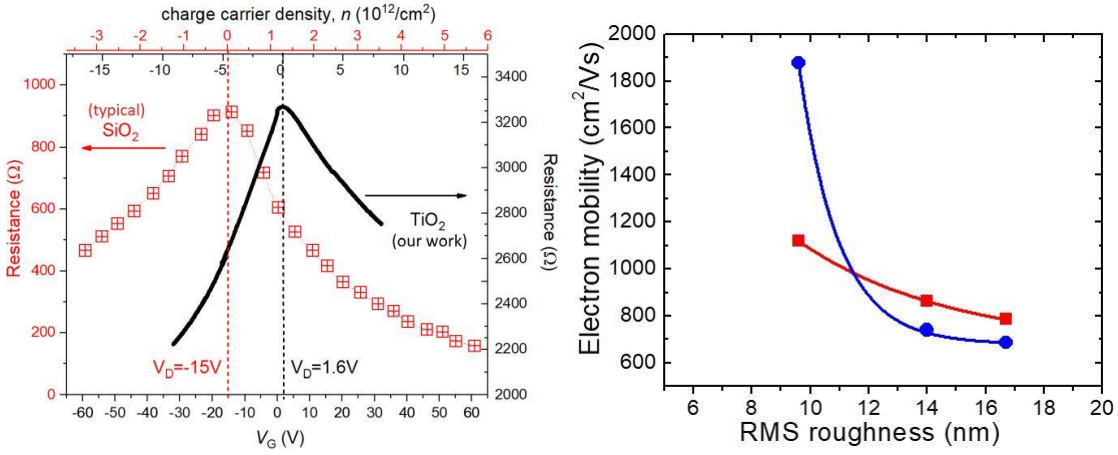

Figure 2: (Left) Comparison of the TiO_2 GFET with respect to a typical SiO_2 GFET [1]. (Right) Effect of roughness on electron (blue circles) and hole (red squares) mobilities of TiO_2 GFETs.