

Evaluations of Graphene to Graphene Contacts

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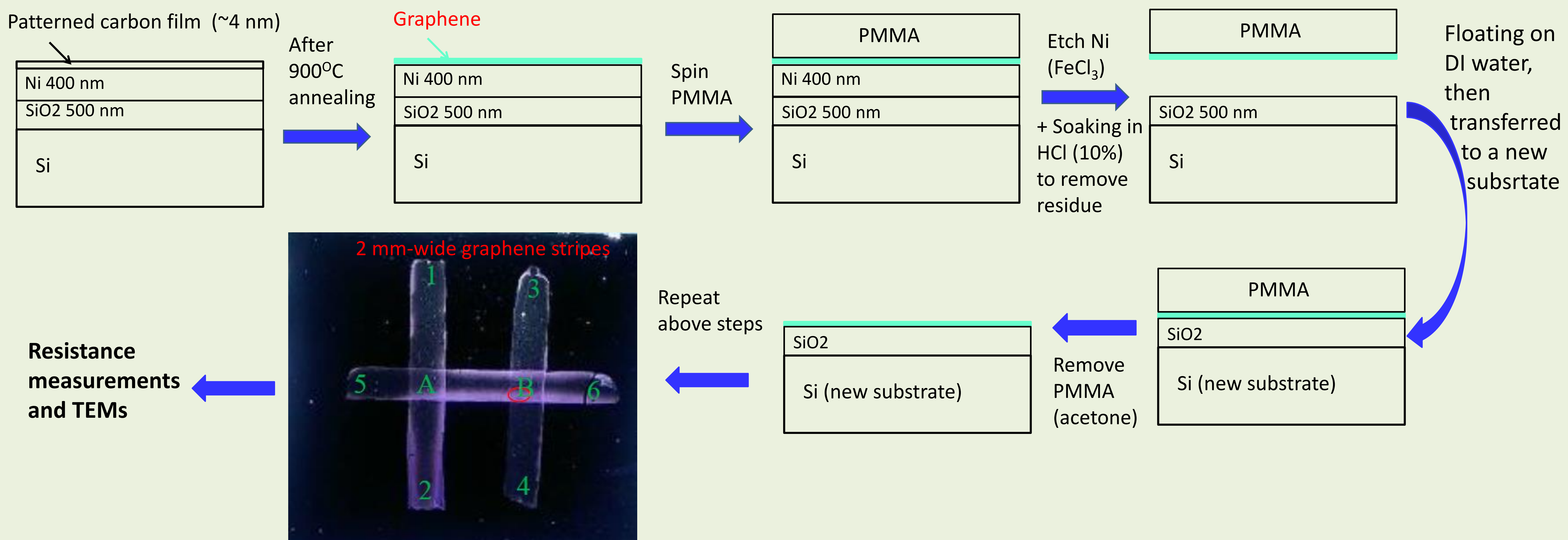


Abstract

Interconnect performance is one of the dominated factors in nano-era integrated circuits. The current density of copper limits the performance of interconnects with nano-scaled dimensions. The development of future high-performance power-efficient technology demands thinner and more conductive interconnects with better current drivability. Recently, carbon-based materials have been considered as one of the most promising candidates for future interconnect technology, such as graphene nanoribbons used for conducting material, a 1-nm graphene film serve as an excellent Cu diffusion barrier and graphene wires to reduce parasitic capacitance and power consumption. Thus, graphene to graphene contact is inevitable for graphene electronics. Junctions between graphene and various metallic contacts have been extensively studied. Here, we investigated graphene to graphene contact resistance. Graphene stripe's resistance and the graphene to graphene contact resistance were studied.

Keywords: Graphene, Nickel, solid carbon source, contact resistance

Experimental Procedure



Results and Discussion

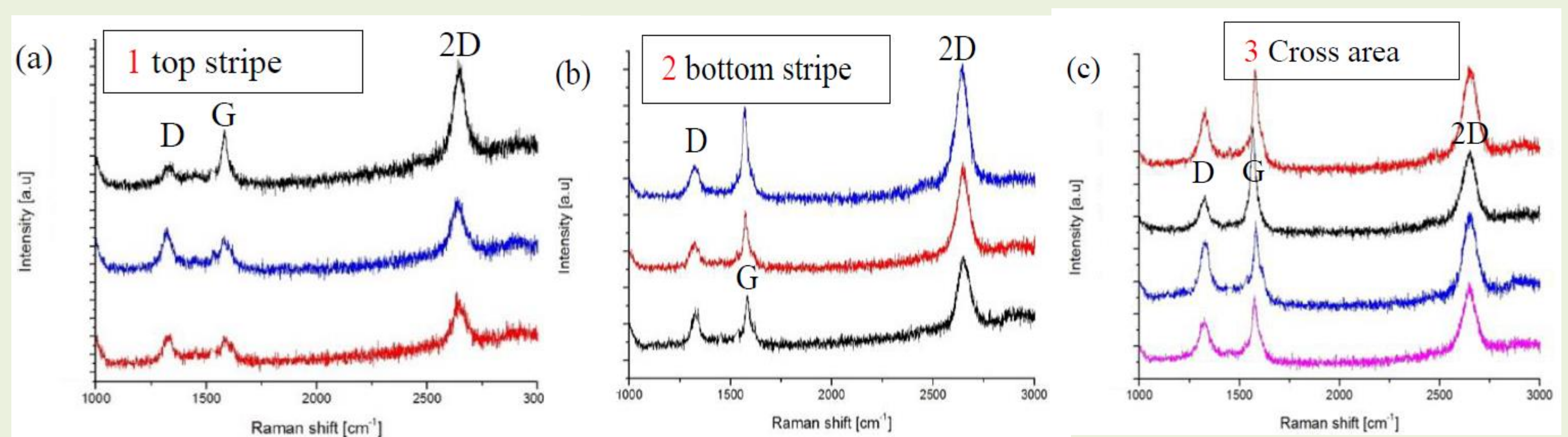
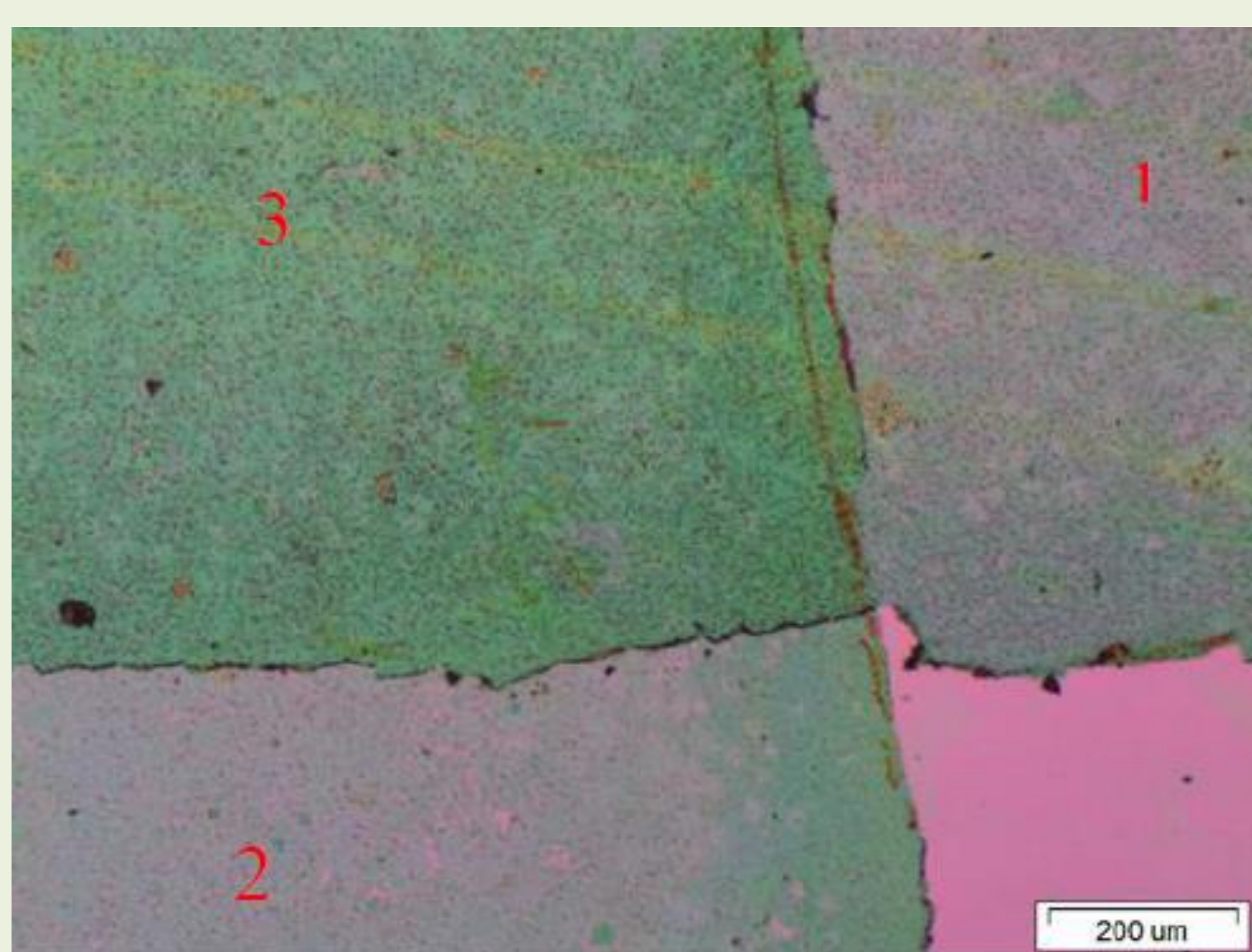


Fig. 1: Image of crossed graphene stripes and Raman shifts measured from (a) top graphene stripe (b) bottom graphene stripe, and (c) the two graphene stripes crossed or contact area.

- The average graphene resistance of these 2-mm-wide stripes is 2.28 kΩ per mm (15 stripes).
- The average graphene-graphene contact resistance is 4.12 kΩ (out of 10 contacts).
- TEM investigations indicate that the gap, ranging from 0.63 nm to 1.55 nm, exists between overlapped graphene stripes.

Conclusions

- More graphene layers were grown at the stripe's edge due to more carbon out-diffuse at thinner Ni film during the RTA cooling step (i.e. uneven graphene layers).
- Gap created by a typical graphene transfer may be inevitable, its impact on current transport at contact area is important and needs further studies.
- Average graphene-graphene contact resistance is 4.12 kΩ.
- Average graphene line resistance (2-mm-wide stripes) is 2.28 kΩ per mm.

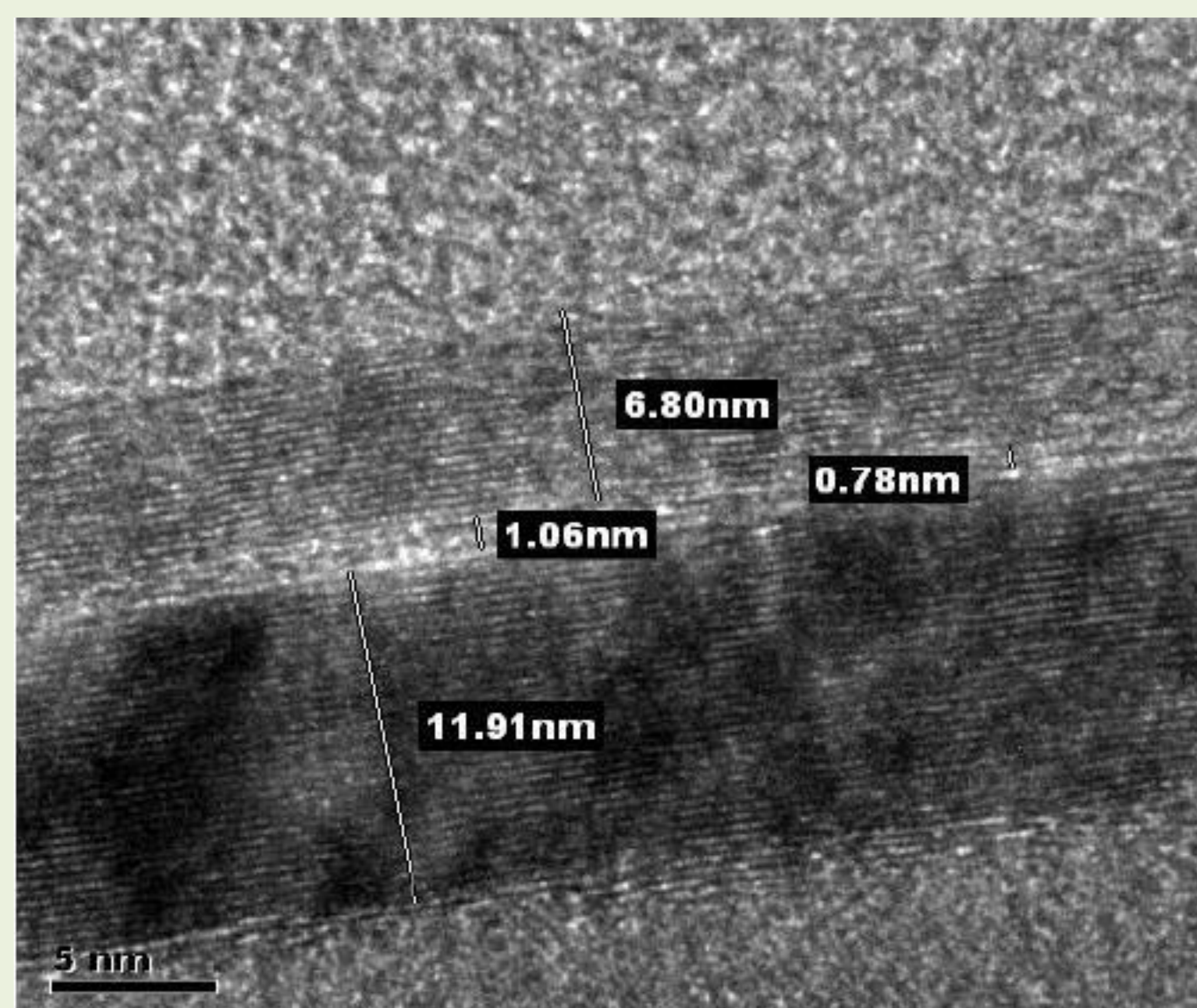


Fig 2: TEM image of contact B at the red circle.