

Graphene-templated directional growth of an inorganic nanowire

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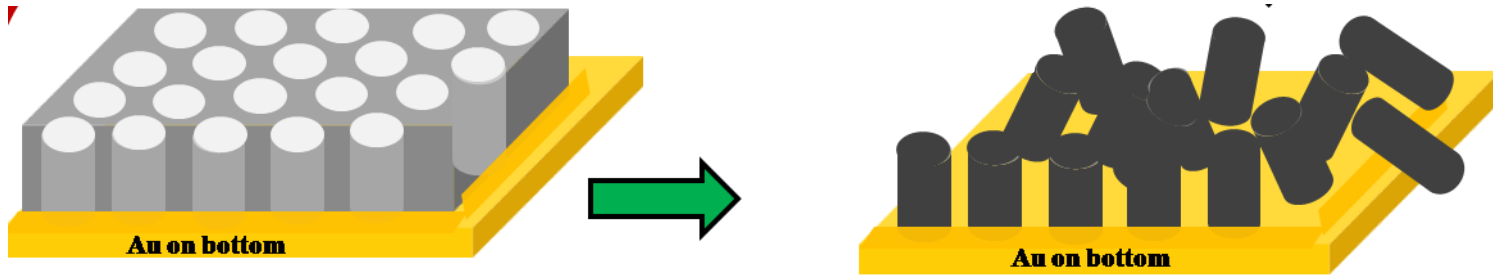
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Nature Nanotech. **10**, 423-428 (2015)

DOI: 10.1038/NNANO.2015.36

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31/10/2015

▪What is template?



▪Different types

▪On which materials we can use

INTRODUCTION:

- ❖ Assembling inorganic nanomaterials on graphene is of interest in the development of nanodevices and nanocomposite materials, which is expected to lead to improve functionalities.
- ❖ For organic materials, it has been aligned on graphitic surfaces by epitaxially.
- ❖ For inertness of graphene, it is difficult to precisely assemble inorganic materials on pristine graphene.
- ❖ Previous techniques have only formed randomly oriented or poor aligned inorganic nanostructures on graphene surfaces.

In this paper.....

- Here they have grown gold cyanide nanowires on pristine graphene, aligning themselves with the zigzag lattice directions of the graphene at room temperature.
- This assembly originates from lattice matching and π interaction to gold atoms.
- Using the synthesized nanowires as templates, they also fabricated nanostructures such as graphene nanoribbons with zigzag-edged directions.

SYNTHESIS:

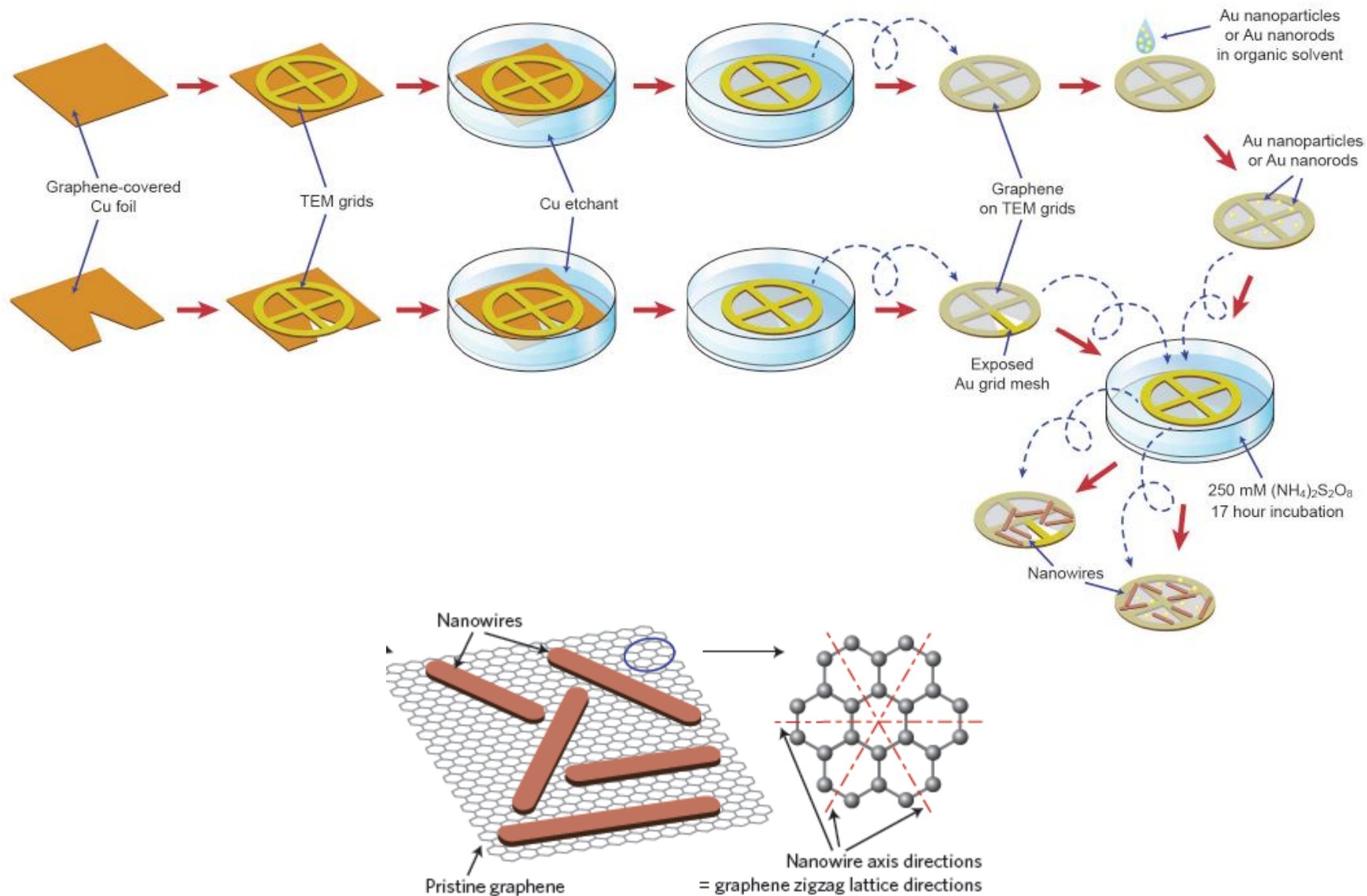


Figure 1. Graphene transfer and nanowire synthesis.

RESULTS AND DISCUSSION:

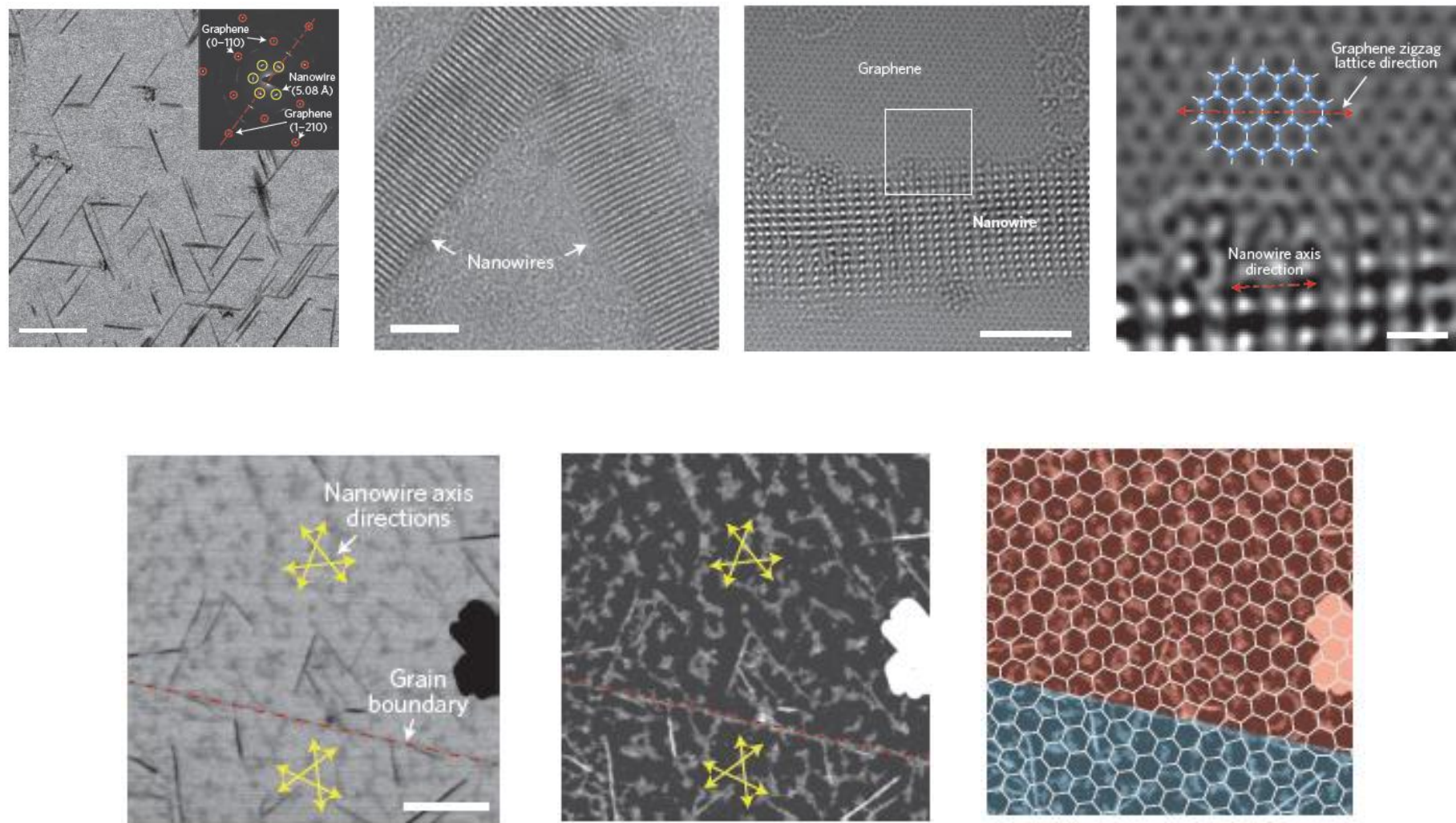


Figure 2. Directional growth of inorganic nanowires on graphene.

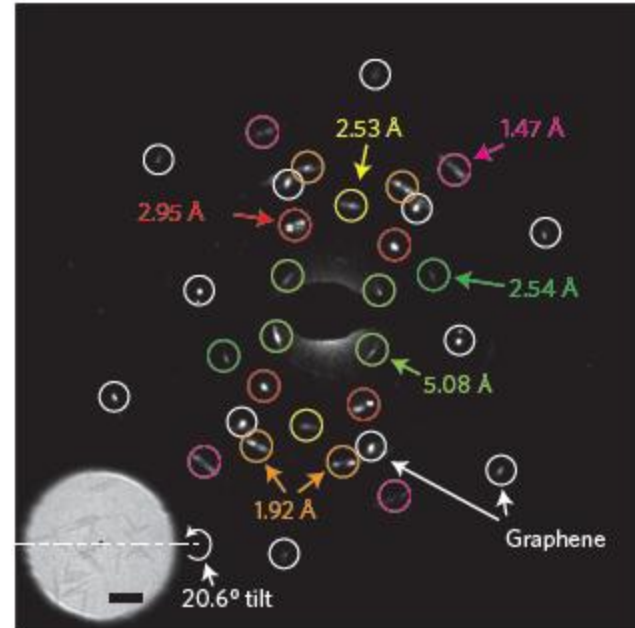
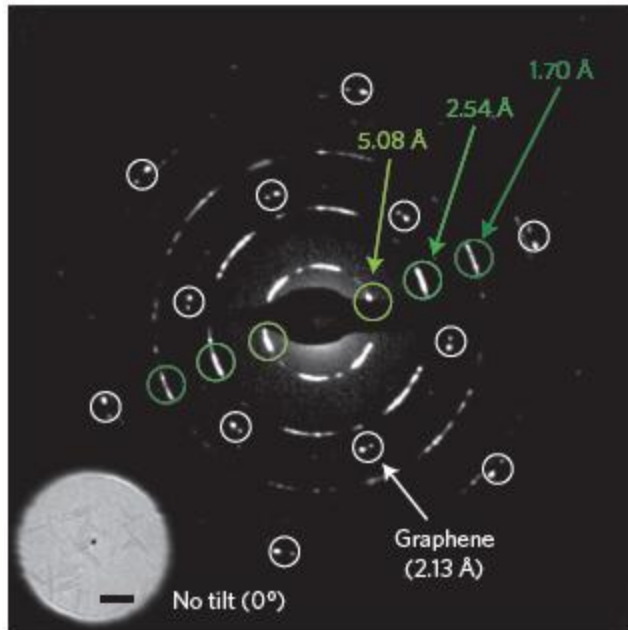
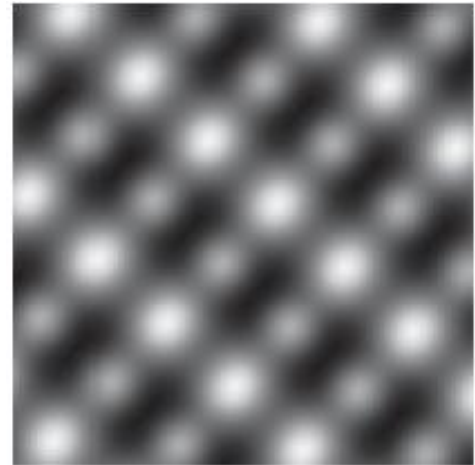
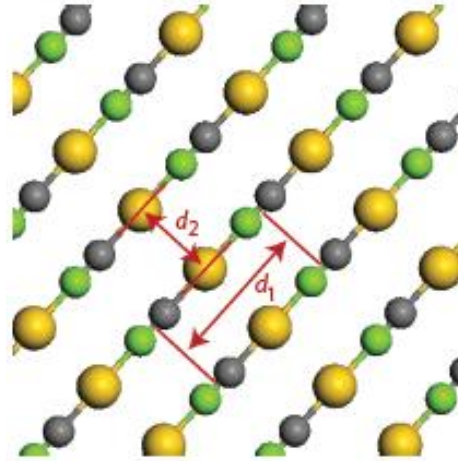
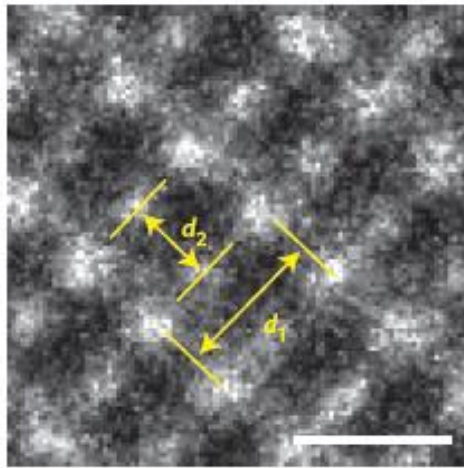


Figure 3. Atomic-resolution TEM imaging and SAED of the nanowires.

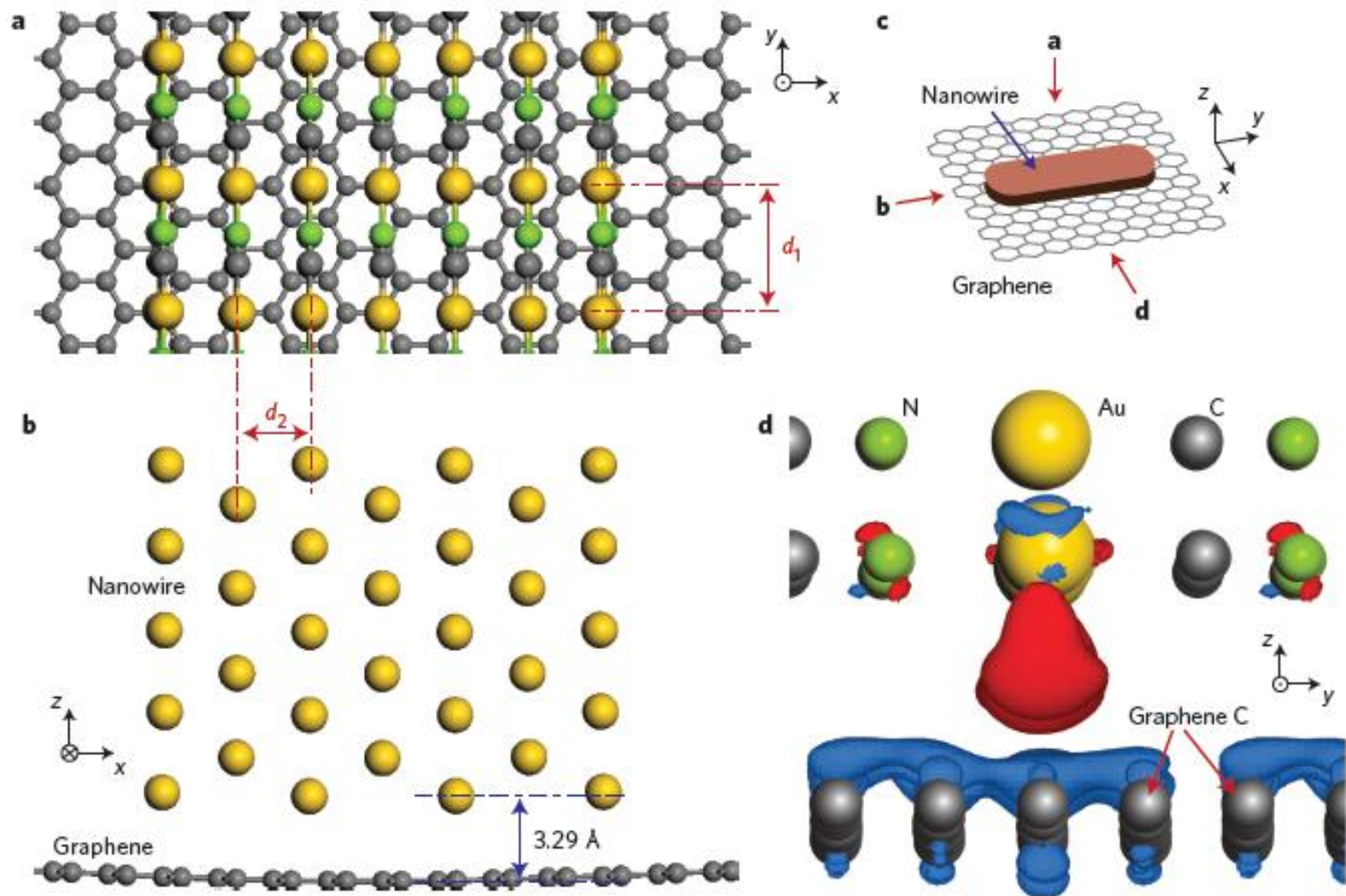


Figure 4. Interaction between the nanowire and graphene estimated by first-principles calculations.

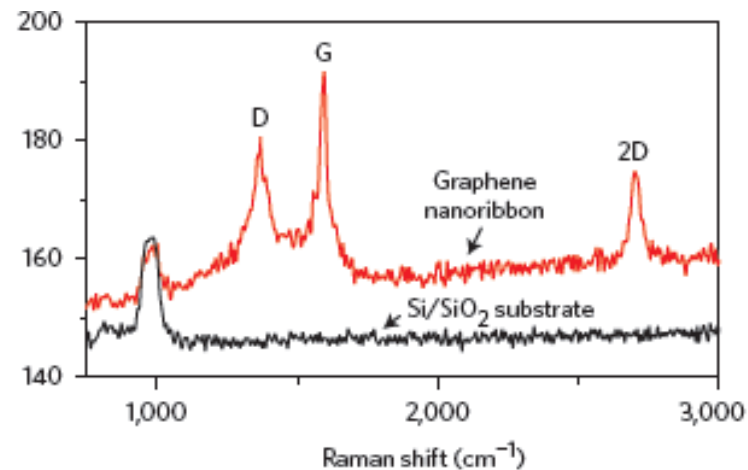
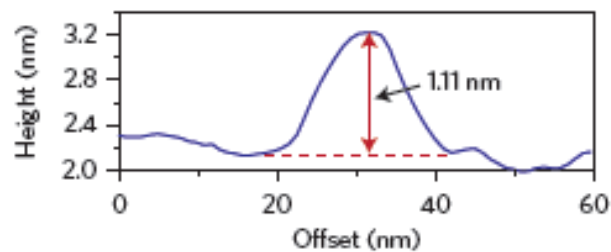
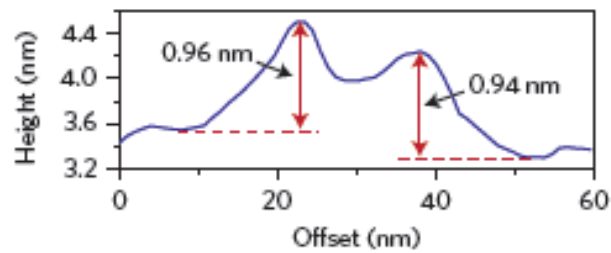
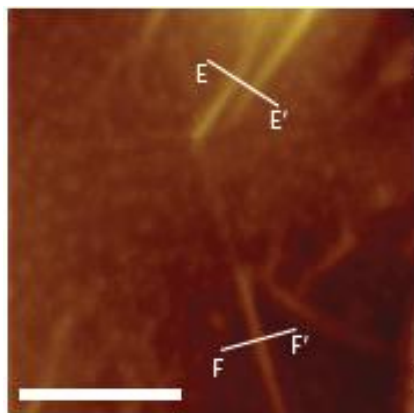
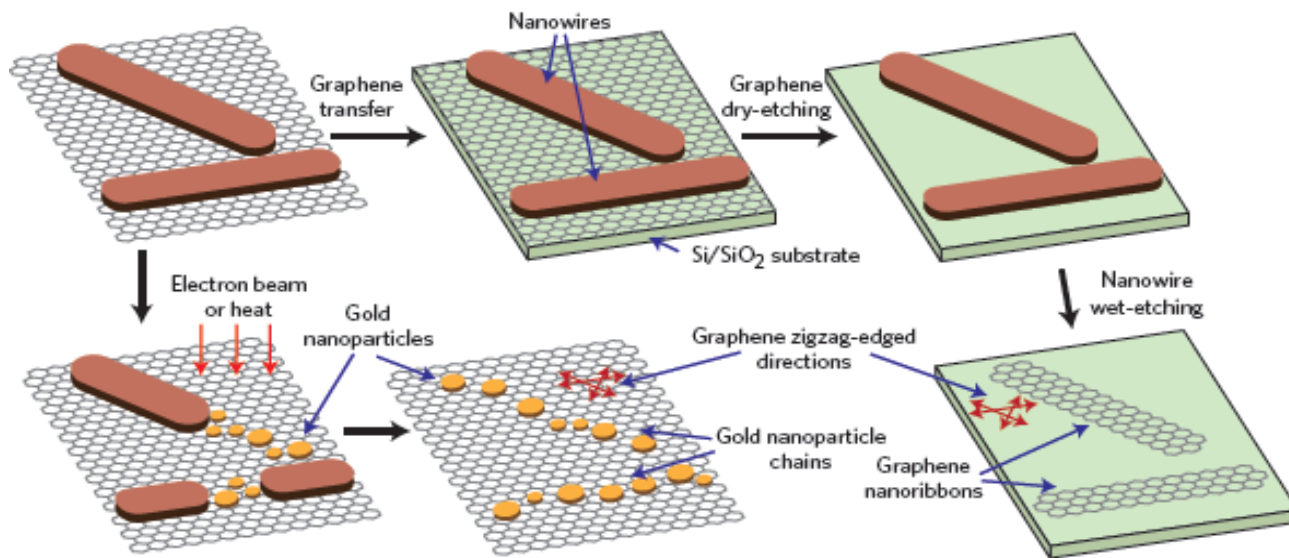


Figure 5. Fabrication of crystallographically aligned nanostructures.

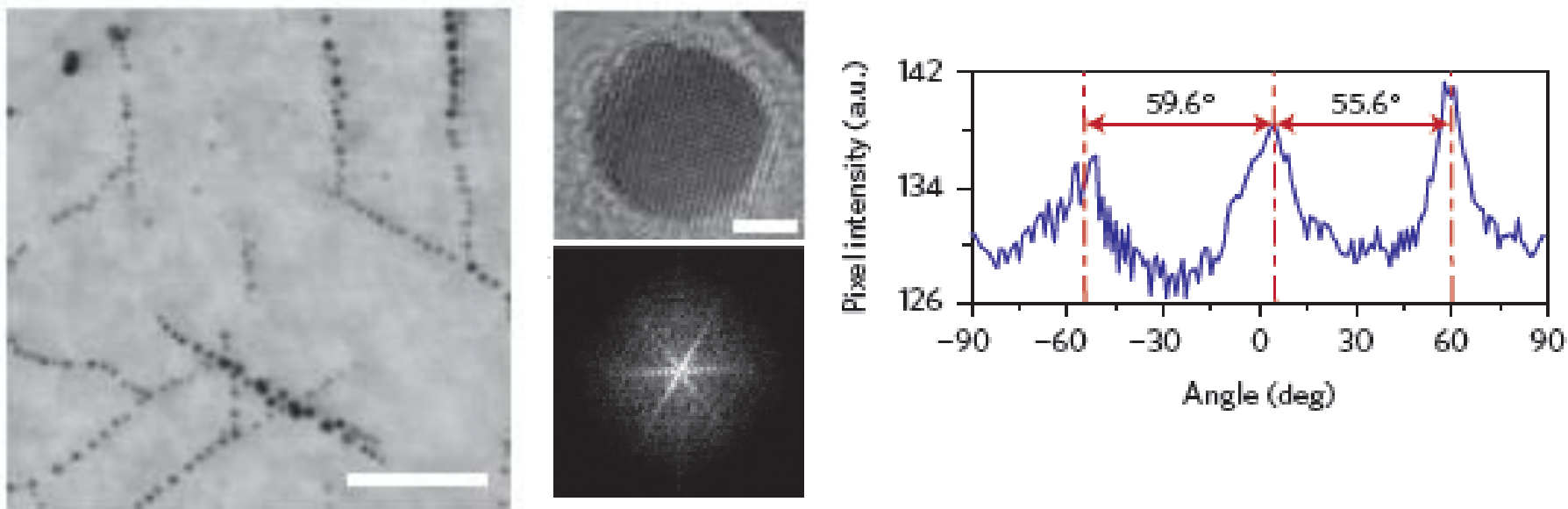
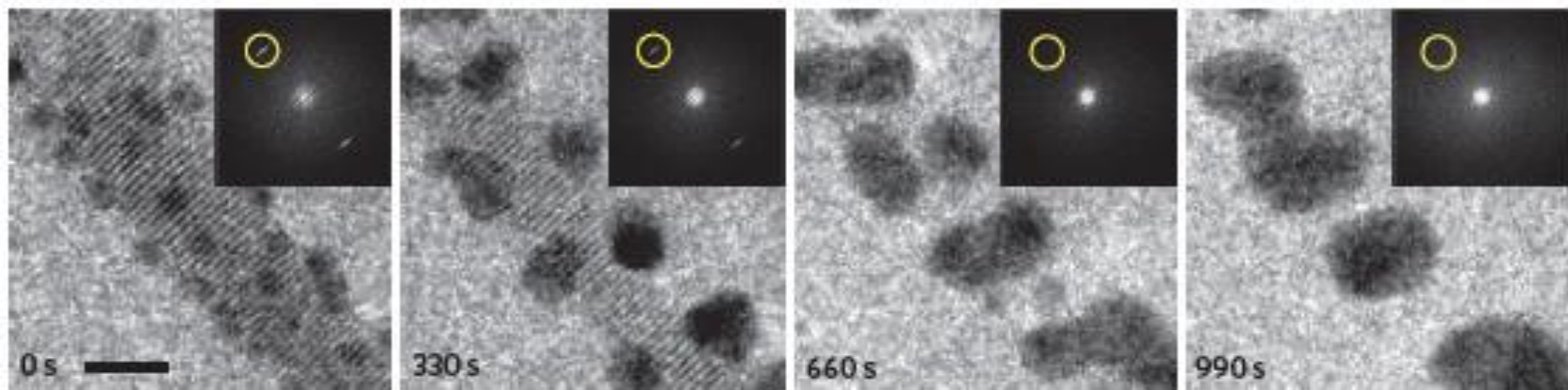


Figure 6. Nanowire decomposition process to gold nanoparticle chains under electron-beam irradiation.

CONCLUSIONS:

- A self-organized growth of inorganic AuCN nanowires was presented which are readily aligned to the zigzag lattice directions of single-layered pristine graphene.
- This direct alignment can be utilized to control crystallographic information about nanostructures, thus enabling us to fabricate graphene nanoribbons with zigzag-edged directions.
- The synthetic method they have introduced demonstrates the possibility of using graphene as a template for advanced classes of inorganic nanomaterials, even with wet chemistry.
- Furthermore, the unique interaction found in this study may provide a new direction for the fabrication of graphene–inorganic heterostructures with intrinsic interface properties.

FUTURE DIRECTIONS.....

I can try this template for gold nanowires synthesis. May be for that we can prepare Au nanowires little shorter length for better understanding.

THANK YOU