

## Improved control in elimination of white impurities on graphene by chemical vapor deposition(CVD)

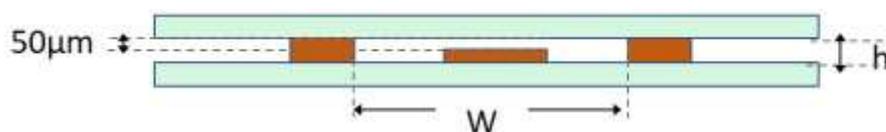
Abstract (Arial Narrow 12)

Chemical vapor deposition (CVD) is one of the most preferred technique of graphene fabrication. However, it still faces some challenges, such as contamination with white particulate impurities which occurs commonly when furnaces with quartz tubes are used in the process. In this work, the source of contamination on copper substrates was traced and tackled in three stages of the graphene fabrication process. The cleaning, annealing, and finally the fabrication stage was studied. No evidence was found to support that copper foil or cleaning tools were sources of the contamination. XPS, EDS and XRD results reveal that the white impurities are silicates, formed due to the phase transition of quartz at elevated temperatures in presence of copper vapor and oxygen gas. It was evident that due to the appearance of this contamination, quartz tubes are not ideal for use in graphene synthesis. However, if unavoidable this study proposes a special substrate configuration which has been found to suppress the contamination during fabrication.

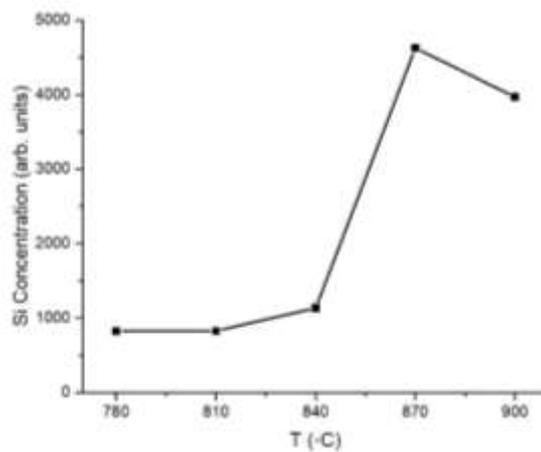
### References

- [1] N. Reckinger, A. Felten, C. N. Santos, B. Hackens and J. F. Colomer, Elsevier Ltd/Carbon, 63, (2016) p.84-91.
- [2] S. M. Kim, A. Hsu, Y.-H. lee, M. Dresselhaus, T. Palacios, K. K. Kim and J. Kong, IOP Publishing Ltd/ Nanotechnology, vol. 24, (2013), page 365602, 7pp.
- [3] N. Lisi, T. Dikonimos, F. Buonocore, M. Pittori, R. Mazzaro, R. Rizzoli, S. Marras and A. Capasso, nature/ scientific reports, 7: 9927, (2017).

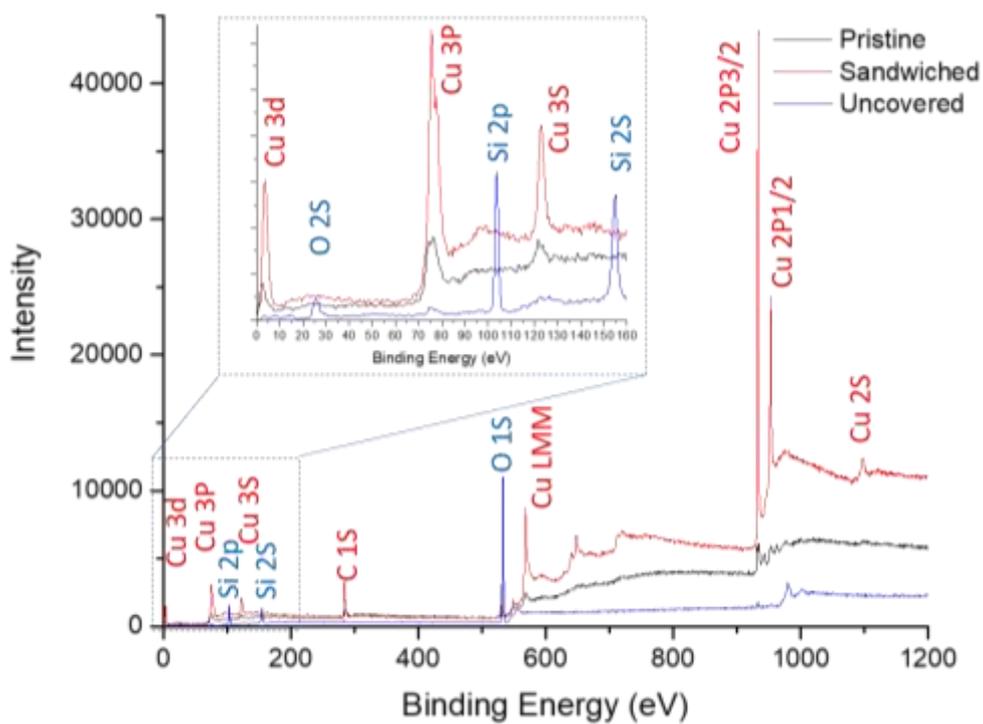
### Figures



**Figure 1:** Configuration of copper substrates in RTP furnace. (a) Totally uncovered. (b) sandwiched with 25  $\mu\text{m}$  free space over.



**Figure 2:** XPS Silicon concentration at different temperatures and in absence of hydrogen gas flow, and constant argon flow.



**Figure 3:** XPS spectra (a) XPS survey spectra for the pristine, sandwiched and un-sheltered sample.