RSC Advances

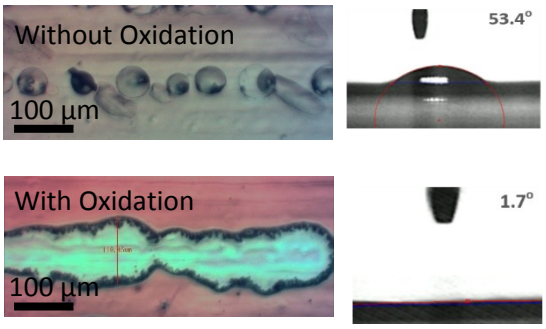
PAPER

Ink-jet patterning of graphene by cap assisted barrier-guided CVD

Received 00th January 20xx,
Accepted 00th January 20xx

DOI: 10.1039/x0xx00000x
www.rsc.org/

Supplementary Fig. S1



XRD analysis

According to XRD spectrum, the printed Al_2O_3 XRD peaks show the $\gamma - Al_2O_3$ phase at 47.48˚, which indicated $\gamma - Al_2O_3$ phases present before annealing process (Figure 2(a) green line, and Figure 2(b)).

For the free flow condition as annealing with H_2 only, without spacer and cap situation, Al_2O_3 barriers were etched away (Figure (c)), and XRD peaks only present Cu crystal peaks at 43.28 ˚, 50.40 ˚, corresponding to (111), (200), respectively (JCPDS Copper: 04-0836)(Figure 2 blue line).

Under the annealing with Ar condition (Figure 2(a), black line and Figure 2 (d)) was to mimic the Al_2O_3 barriers annealing process with the cap and spacer condition, which is to consider the limited H_2 gas flow during the annealing process. As the Figure 2 black line and Figure (d) shown the $\alpha - Al_2O_3$ present after annealed with Ar only, which may imply that the $\gamma - Al_2O_3$ can be preserved without H_2 etching and convert into a stable $\alpha - Al_2O_3$ in the real condition.

Notice that Cu_2O (111), (200) (JCPDS card, no# 125678-2076) (Figure 2 blue line) phase appeared after annealing wit Ar only process, and no strong Cu (111) and (200) present, which indicated that Cu was convert into Cu_2O through thermal-oxidation during the annealing process.

[a] Graduate Institute of Opto-Mechatronics, National Chung Cheng University, Chiayi, 62102, Taiwan E-mail: yphsieh@ccu.edu.tw
[b] Department of Physics, National Taiwan University, Tainan, 106, Taiwan
E-mail: corresponding to: yphsieh@gate.sinica.edu.tw

Electronic Supplementary Information (ESI) available: [Microscope images and complete Raman spectra]. See DOI: 10.1039/x0xx00000x