Optimisation Of The Transfer Of CVD Graphene Using FMEA

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Abstract
Current methods for producing large area, high quality graphene are achieved via chemical vapor deposition on a sacrificial catalyst foil, followed by transfer of resultant graphene to a target substrate for device realization [1]. The end performance of graphene is highly affected from this transfer process, which consists of several interdependent highly delicate and precise process steps. Optimizing this transfer process therefore has gained significant research focus. However many challenges still remain. In this work the efficiency and reliability of the graphene transfer process was systematically investigated and improved using a structured Failure Mode and Effect Analysis (FMEA) method [2]. Failure possibilities were assessed for each step by evaluating the impact severity (SEV), the occurrence (OCC) and the method of detection (DET). Improvements were then applied to the steps with the highest Risk Priority Number (RPN) using pareto analysis. The resultant films of graphene transferred were obtained with a significant reduction in defects. Resultant high quality graphene transfer films were obtained with <2% mechanical defects. This corresponds to a >20% reduction in defects when compared with the pre optimisation process.

References

[1] Chen, Y.; Gong, X.-L.; Gai, J.-G. Advanced Science 2016, 3, (8), 1500343-n/a.

[2] Stamatis, D. H., Failure mode and effect analysis: FMEA from theory to execution. ASQC Quality Press: New York, 1995

Figures

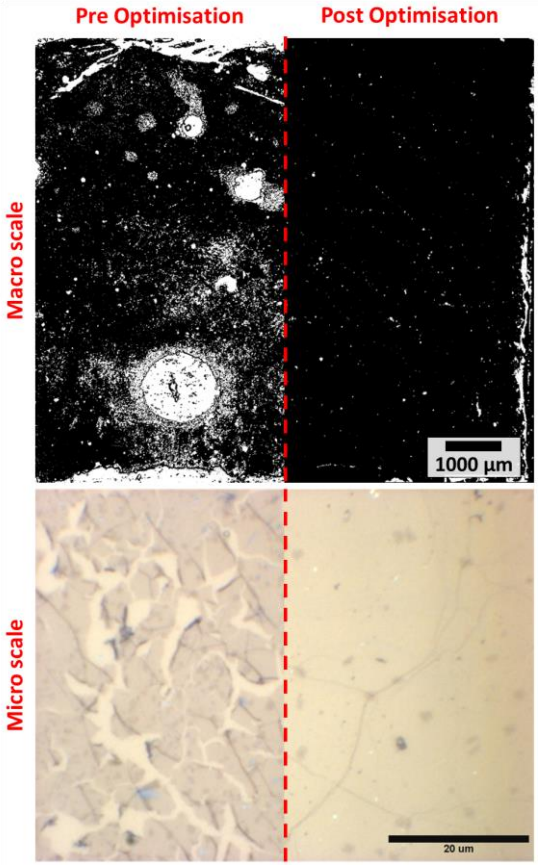

Figure 1: Transferred graphene without and with optimisation of the procedure.

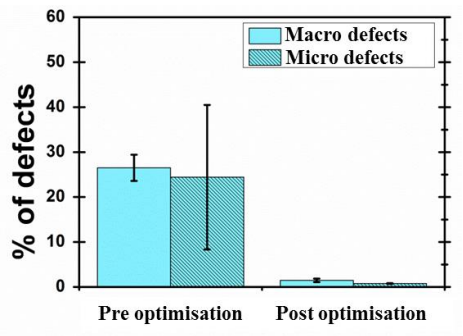

Figure 2: Bar chart representing the percentage of defects by area Pre and Post optimisation.