

Layer-layer assembly of water-based graphene for facile fabrication of sensitive strain gauges on paper

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ABSTRACT

Paper has been proposed as an alternative substrate material for graphene-based strain gauges due to its high flexibility and accessibility when compared to the conventional substrates such as polymer that is not only rigid but also not recyclable. In the fabrication of graphene-based strain gauges on paper, inkjet printing is commonly used as the main deposition method of graphene on paper as this process allows a systematic control of strain gauge resistance by manipulating several factors such as print passes and drop spacing. However, the availability of inkjet printers that allows the printing of graphene solution is an issue as industrial inkjet printers can be obtained only at a premium price while modification of commercial inkjet printers is a must to replace the original ink with graphene ink. To counter this issue, a commercial photo paper has been used for the first time as a substrate during vacuum filtration of graphene solution for layer–layer assembly of strain gauges on paper. With the resulting gauge factor of up to 83 at the maximum and minimum strain of 1.4% and 0.03% (sensitivity of 1.25%) respectively, the fabricated strain gauge from photo paper shows the potential of paper to be used as a component in the future wearable device. Meanwhile, the advantages of using vacuum filtration as the selected technique for the deposition of graphene meanwhile are demonstrated in this work by varying the gauge factor through controlling the graphene deposition volume.

Keywords: Layer-layer assembly; Water-based graphene; Facile; Strain gauges; Paper

DOI: <https://doi.org/10.1007/s10570-018-2222-4>

Acknowledgments

The author acknowledges Universiti Malaysia Pahang for financial support (RDU 1803134) in this research work.