

Laser writing of graphene on cellulose paper and analogous material for green and sustainable electronic: a concise review

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ABSTRACT

With the aim to fabricate flexible, mobile, and low-energy powered electronics, laser treatment of paper-based materials from carbon, cellulose, and natural products may be viable as one of the strategies to achieve this objective as it potentially provides a sustainable and precise patterning of a graphene-based circuit for various emerging electronic applications, such as sensor, robot, energy, and memory devices. Irradiation of high-energy beam for induction of porous-rich graphene or reduction of graphene oxide is easily accomplished from a commercially available laser machine with various laser sources, power, and pulse number setting. Moreover, the process itself can easily be adapted in the various manufacturing sectors due to the technology's maturity status and its ability to be computer programmed. In comparison to environmental-benign polymer, the selection of paper as a substrate for electronics may introduce a new idea into the design possibility of electronic devices since the paper is not only thin, lightweight, biodegradable, and mechanically stable, but is also able to be assembled into another form and shape simply by traditional origami and kirigami technique for many applications. Here, in this work, recent laser processing strategies for the preparation of graphene either from graphitization of cellulose or deoxygenation of graphene oxide for green electronics are reviewed with brief coverage of the deposition technique of graphene oxide paper prior to laser annealing and discussion on the emerging relevant electronics field that benefitted greatly from the laser-assisted fabrication. To conclude the literature study, a remaining challenge, and prospective outlooks of laser writing of graphene on paper are also highlighted. © 2022, The Author(s), under exclusive licence to Korean Carbon Society.

KEYWORDS

Cellulose paper; Graphene paper; Green electronics; Laser writing; Reduction