Synthesis of high quality graphene and graphene based structures using laser beams and their applications.

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ABSTRACT

After almost fifteen years of intense fundamental graphene research it is generally accepted that graphene's superior physical properties are currently well understood. Major experimental challenges are now related to the large-scale production of high-quality graphene, which is the prerequisite to evolve fundamental graphene science into technological applications. The full potential of laser assisted methods in graphene production has not yet been unlocked, despite that these methods offer a number of advantages as they are fast, low-cost, environmentally friendly and adaptable to current technological platforms. Few investigations have appeared so far aimed at producing graphene using laser, while much more systematic approaches have been undertaken for processing of graphene oxide (GO) towards obtaining reduced graphene oxide (rGO). Laser wavelengths ranging from ultraviolet to infrared have been used both in the cw and pulsed modes. In their vast majority, studies of laser-assisted methods result in graphene of dubious quality. We present the current status of the role of lasers in graphene production and processing and discuss recent advances in our laboratory concerning the laser-assisted growth of graphene and graphene-based structures. In particular we will present activities related to: (i) the preparation of graphene-coated SiC particles [1]; and (ii) the reduction of GO to rGO of ultralow sheet resistance using pulsed lasers [2] and their potential application to wearable e-textiles.

REFERENCES

[1] A. Antonelou, V. Dracopoulos and S. N. Yannopoulos, "Laser processing of SiC: From graphene-coated SiC particles to 3D graphene froths", Carbon 85, 176–184 (2015).
[2] A. Antonelou, L. Sygelou, K. Vrettos, V. Georgakilas and S. N. Yannopoulos, "Efficient defect healing and ultralow sheet resistance of laser-assisted reduced graphene oxide at ambient conditions", Carbon 139, 492–499 (2018).