Laser-induced conversion of phenol-based resins to graphene-like structures at ambient conditions

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ABSTRACT

Processing of carbon-containing compounds by lasers is an effective route towards the synthesis of graphene-like structures[1,2] while being competitive against thermal or chemical methods, due to its low cost and environment-friendly character. The carbon-containing compound used in the current study is a phenol-based resin. The irradiation source was a commercially available, millisecond-pulse, near-infrared (1064 nm) Nd-YAG laser, widely used in industry for welding applications. It is demonstrated that irradiation leads to a significant conversion of the polymeric resin state into a sp^2 network. The enhanced properties of such networks can be beneficial to applications, such as energy storage/conversion devices, optoelectronics, photonics, sensors etc.[3]. As this transformation is accomplished at ambient conditions, using a low-cost, eco-friendly method, it is suitable for scale-up to industrial production.

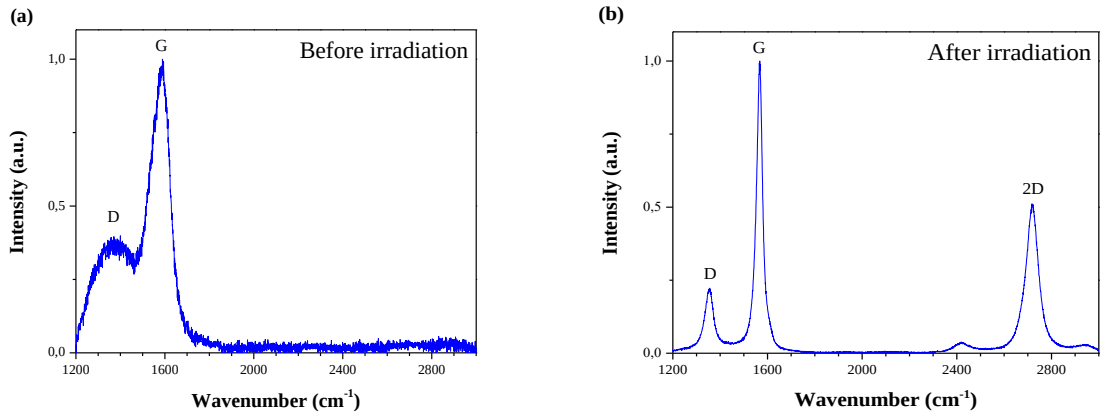

Figure 1: Raman spectrum of resin prior to (a), and post (b) laser irradiation, respectively.

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