UPCYCLING OF COMPOSITE RECYCLING WASTES: CNTs GROWTH FROM PYROLYSIS AND SOLVOLYSIS BY-PRODUCTS

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ABSTRACT

Sustainable management of plastic waste has emerged as a crucial environmental aim for the near future. In particular, the urgency to shift the management of end-of-life thermoset polymer matrix composite materials from landfilling to more eco-friendly approaches, has become evident. Recycling of such materials is challenging, as melting and re-moulding is not possible, thus thermal and chemical recycling, such as pyrolysis and solvolysis, have become prevalent [1]. These processes are being used for fibrous reinforcement reclamation, while allowing wastes retrieval. Both processes produce high carbon content by-products, which can be further processed. Recent studies have shown that waste plastics can be utilized for carbon nanotubes (CNTs) production; a high value nanomaterial with exceptional mechanical and electrical properties, through chemical vapor deposition (CVD) [2], [3]. The aim of the current study is the valorisation of thermoset composites liquid recycling wastes, by using them as precursors to grow high-value carbon nanomaterials through CVD. The feasibility of CNTs growth was examined when using pyrolysis and solvolysis by-products as carbon sources. Furthermore, a modification of the existing horizontal CVD reactor system was realised, to introduce organic liquid precursors in a controlled manner. CNT structures were successfully produced and characterized via scanning electron microscopy (SEM), Raman spectroscopy, thermogravimetric analysis (TGA), and X-ray diffraction analysis (XRD).

KEYWORDS: CNT, CVD, recycling, pyrolysis, solvolysis

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