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Estimating the sustainability of carbon nanotube composites: reprocessing studies

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Poly(lactide) (PLA) has attracted particular attention in the area of environmentally degradable polymer materials. Some applications require the incorporation of a reinforcement material to produce a composite with specific properties. It was observed that PLA /carbon nanotube (CNT) composites present adequate properties for liquid sensing [1].

The health risks involved in the use of carbon nanotubes are still under study, and thus the application of these materials must be planned with caution. From the point of view of environmental protection, recycling the CNT composites is the way to reduce these problems to the lower level possible, by maximizing their life cycle.

The work presented reports the processing of PLA/CNT composite monofilaments, produced for sensing applications, and their reprocessing to form new monofilament composites. The monofilaments were reprocessed three times, and the tensile properties and electrical resistivity were measured. The melt flow index of the nanocomposites after each reprocessing step was measured. The thermal stability was evaluated by thermogravimetric analysis.

It was observed that, although the melt flow index increased with reprocessing cycles, the tensile and electrical properties of the monofilaments produced after reprocessing were not affected, even after the fourth processing cycle. The thermal stability of the filaments was comparable after each processing cycle.

[1] K. Kobashi, T. Villmow, T. Andres, L. Häußler and P. Pötschke, *Smart Mater. Struct.* 18 (2009) 035008 (15pp).