

Title: On the possibility of utilizing recycled carbon fibers as reinforcement for the lightweight manufacturing automotive components

Luca Quagliato, Changsoon Jang and Naksoo Kim
Sogang University, Department of Mechanical Engineering, Seoul 04107, Republic of Korea

Carbon fiber (CF) reinforced polymer materials are largely utilized in different industrial sectors thanks to their high-performances and limited weight. However, a vast utilization of carbon fibers for product manufacturing poses, at the same time, an issue for their treatment at the end of their life. Although most of the research and industrial application have headed towards the direction of creating bundles of long fibers, recycled CF can also be chopped and utilized as reinforcement for thermoplastic polymers. This approach reduces the influence of the recycling-process-induced defects on the fiber surface and allows their large utilization in the market thanks to the vast utilization and lower price of the plastic injection molding process, in comparison to standard thermoset-matrix-based manufacturing process. In this research, an analytical model is proposed to explore the influence of utilizing combinations of virgin and recycled carbon fibers on the mechanical properties of components, taking into account fiber length and fiber orientation distributions. Moreover, to prove the industrial applicability of the proposed material concept, the case of an automotive cross-member, originally manufactured by steel, has been analyzed to explore the possibility of its realization by means of plastic injection molding with PP+25%vCF+25%rCF with local metal inserts to increase the stiffness of the critical areas. The results of the research show how an integrated material-product-process design allows utilizing virgin and recycled carbon fibers as reinforcement for thermoplastic polymers with a substantial weight reduction and similar mechanical properties in comparison to full-steel components.

Biography

Luca Quagliato has completed his Ph.D. in Mechatronics and Product Innovation Engineering at the University of Padua (Italy) and is currently working as Post-Doc Research Assistant at the Dept. of Mechanical Engineering of the Sogang University (South Korea). Doctor Quagliato is author of 14 papers on international journal and 5 conference proceedings on analytical modelling of plasticity, metal forming and metal-composite multimaterial forming.

Presenting author details
Full name: Luca Quagliato
Contact number: +82-10-8558-8702
Twitter account: /
Linked In account: linkedin.com/in/luca-quagliato-a09902b2/
Session name/ number: Track 3 - 1
Category: Oral presentation