Abstract Submission to the 2025 REMADE Circular Economy Tech Summit and Conference

Title

Upgrading Reclaimed Carbon from Tire Pyrolysis for Tire Rubber Applications

Authors

Constantine Khripin*, Theis Clarke, Tom McElwain, Mark Pender, Geoffrey Moeser

Author Affiliation

Cabot Corporation, 157 Concord Rd, Billerica, MA 01821

Corresponding Author

Dr. Constantine Khripin
157 Concord Rd
Billerica, MA 01821
Constantine.khripin@cabotcorp.com
610-216-66438

Topics

Primary Topic: Emerging Recovery and Recycling Technologies
Secondary Topic: Pathways to Net Zero Emissions in Manufacturing and Materials Production

Abstract

Most major tire manufacturers have set a goal of using 100% sustainable materials in tire production by 2050. Carbon black (CB), which is a critical ingredient in rubber formulations and can constitute up to 30% of tire rubber by weight, is currently manufactured from fossil-based byproduct feedstocks and presents a major hurdle to this commitment. Therefore, Cabot Corporation and the tire industry are actively developing circular and sustainable alternatives to conventional CB.

Pyrolysis is a promising, emerging technology in tire recycling. This process produces tire pyrolysis oil (TPO) and reclaimed carbon (rC). Although sometimes marketed as a 1-1 replacement for carbon black, rC falls short in many important performance attributes, precluding its use in demanding “reinforcing CB” applications, and limiting concentrations to < 20% in less demanding “semi-reinforcing CB” applications.

To address some of these challenges, Cabot is developing a technology that upgrades the performance of rC and produces a product with significant rC content. The rC is upgraded to make the higher circular content possible while maintaining rubber performance similar to CB. In this paper, we first examine the performance of un-upgraded rC to illustrate the difficulties it presents with respect to meeting rigidity and other performance targets in rubber composites. We then compare a 30% rC content product made with our new technology with a conventional CB and a 30%/70% rC/CB physical blend. We show that not only can the upgraded product meet the rigidity performance of conventional reinforcing CB, but the rigidity can be tuned by the upgrading process, giving greater flexibility and increased potential to meet industry demands.