

# 8<sup>th</sup> World Congress and Expo on Recycling

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## Recycling of used tires: Processing and characterization of complex materials

**Denis Rodrigue**

Université Laval, Canada

**Statement of the Problem:** In developed countries, an average of one used tire per inhabitant is generated every year. This produces a large amount of materials after their end of life which must be carefully managed. Since landfilling and stockpiling is no longer an option due to safety hazards and environmental concerns, solutions must be found to reuse this high amount of post-consumer materials available. Based on the concepts of sustainable development, burning for energy recovery is also limited. This is why recycling is proposed to get added-value products and increase the economic aspect of the processes.

**Methodology & Theoretical Orientation:** In this work, it is proposed to separate the tire structure into its main components: steel, fibers (RTF) and rubber (GTR). Then, applications are proposed to reuse the different fractions. In particular, the rubber can be blended with thermoplastic resins to produce thermoplastic elastomers (TPE), while the fibers can be used to produce composite materials based on different matrices. In our work, processing conditions (pressure, temperature, speed) and formulation (component and concentration) are optimized based on different polymer matrices to improve the mechanical properties of the compounds.

**Findings:** Our results show that ground tire rubber can be very effective to improve the toughness and impact strength of polymers, while recycled tire fiber can improve the strength and stiffness of polymer composites. Nevertheless, care must be made as contamination is always a concern.

**Conclusion & Significance:** By reusing a large amount of waste tires, this substantially reduces the materials accumulating and generates new compounds for similar and/or different applications. Overall, wastes are converted into raw materials producing added-value products and economic wealth. Recommendations are finally made to improve the amount of material being recycled and propositions are made to develop new applications.

denis.rodrigue@gch.ulaval.ca