

# **Towards an integrated depolymerisation option of End of Life Tyres into carbon materials by means of the DEPOTEC LIFE+ concept.**

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Keywords: ELT, CBp, AC, soil ameliorant, photocatalytic materials, substrate mimetics.

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The goal of this study is to develop a roadmap for a sustainable valorization of End of Life Tyres (ELT), for carbon-based materials production via depolymerisation, by means of pyrolysis, in order to provide a sustainable management solution within EU legislative requirements. Among several methods of management and valorization, pyrolysis proved to be a promising alternative since it can lessen effectively ELT stored reserves, while resulting to valuable products and sustain energetically the process. In the concept of LIFE+ DEPOTEC project, ELT pyrolysis performed at 500 °C under N<sub>2</sub> supply, producing pyrolysis gas, liquid, and a solid residue (char) (DEPOTEC, 2011-2014). The quality of gaseous and liquid fuels highlighted their high energy content, permitting their energetic valorization on-site enhancing process's sustainability, whereas char's high sulphur content, originated from vulcanization and sulphur deposition during pyrolysis, prevents energetic valorization option (Antoniou and Zabaniotou, 2013).

ELT char is a mesoporous material of low moisture, with high carbon content (Williams, 2013). Many possible beneficial applications of ELT char are being evaluated, aiming either to decrease cost during tyre manufacturing, or to provide value-added products.

Perspectives of char valorization towards innovative carbon-based materials can incorporate solutions including: a) its use as substitute of certain Carbon Black (CBp) groups during tyre manufacturing, b) as a precursor material for activated carbon (AC) production, c) upgrading to an organic soil ameliorant; however, certain modifications regarding its structure and chemical properties are required so as to fully conform to EU standards, d) complex photocatalytic materials, and e) catalytic substrate mimetics.

The roadmap will include process requirements, in terms of operating conditions applied to ELT char (temperature, residence time and oxidizing agent, washing and post treatment etc.) for each carbon-based product, providing a suitable and a well-tailored technical solution, affecting material quality, while functioning also as the key point to achieve both environmental and financial sustainability.

## Acknowledgments

The authors would like to acknowledge EU funding under DEPOTEC project (LIFE10 ENV/IE/000695).

## References

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