MICROBIAL DEVULCANISATION OF GROUND TYRE RUBBER

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ABSTRACT

A major hurdle in the reclamation of tyre rubber is the structural stability brought about by vulcanisation. Devulcanisation aims to selectively break the sulphur crosslinks in the tyre matrix, resulting in a reclaim product that finds a variety of applications, including incorporation into new tyres. Microbial sulphur oxidation for devulcanisation of rubber waste tyres is therefore investigated. Sulphur-oxidising autotrophs are of particular interest due to specificity towards sulphur bonds while leaving the carbon backbone intact, as opposed to non-selective mechanical and thermo-chemical devulcanisation that result in a reclaim product with weakened mechanical properties from disrupting the carbon-carbon bonds. The choice of microorganism represents a key variable in this work, which will be sourced from similar applications in biomining and coal or oil desulphurisation processes.[1,2,3] Although the study will emphasise the toxicity of rubber components to the microorganisms, the potential of pretreatments to improve accessibility to the rubber particle will also be investigated. Results from this study will inform on technically feasible avenues for environmentally friendly waste tyre rubber reclamation. A review on the current state of microbial desulphurisation of vulcanised rubber will be presented, along with a comparison with other devulcanisation techniques.

References

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