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Scrap tyre recycling process with molten zinc as direct heat transfer and solids separation fluid: A new reactor concept

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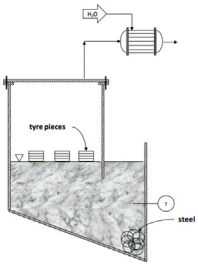
GRAPHICAL ABSTRACT



ABSTRACT

Every year about 1.5 billion tyres are discarded worldwide representing a large amount of solid waste, but also a largely untapped source of raw materials. The objective of the method was to prove the concept of a novel scrap tyre recycling process which uses molten zinc as the direct heat transfer fluid and, simultaneously, uses this media to separate the solids products (i.e. steel and rCB) in a sink-float separation at an operating temperature of 450–470 °C.

This methodology involved:

- construction of the laboratory scale batch reactor,
- separation of floating rCB from the zinc,
- recovery of the steel from the bottom of the reactor following pyrolysis

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ARTICLE INFO
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Method details

Experiments on a laboratory scale version of a proposed tyre pyrolysis process [1] were conducted to demonstrate the feasibility of separation of the solid tyre pyrolysis products (i.e. steel and recovered carbon black (rCB)). The proposed tyre pyrolysis process uses molten zinc as the direct heat transfer and separation media for the solid pyrolysis products (i.e. steel, which sinks, and rCB, which floats on the molten zinc). The essential features of the pyrolysis reactor [1,2], namely; its U-shaped structure,

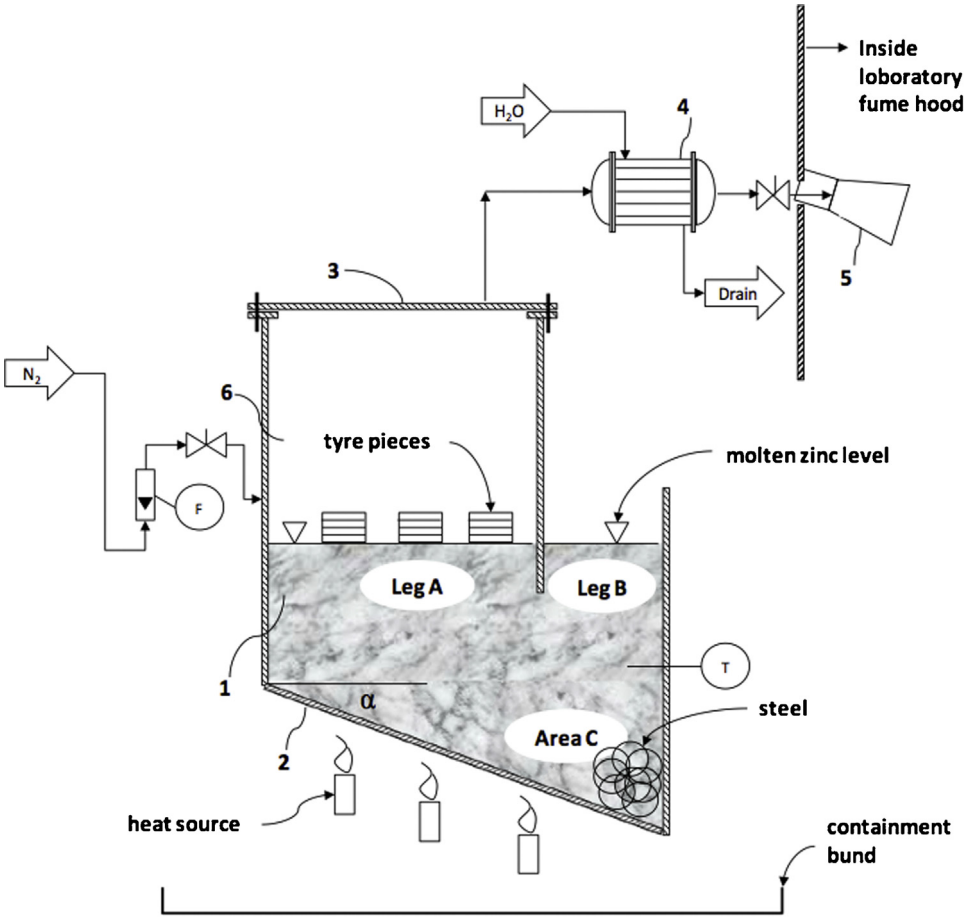

Fig. 1. Layout and P&ID of the laboratory scale tyre pyrolysis plant. (T = temperature gauge, F = N_2 flow meter (rotameter), N_2 = nitrogen, α = 45°; numbers see text).