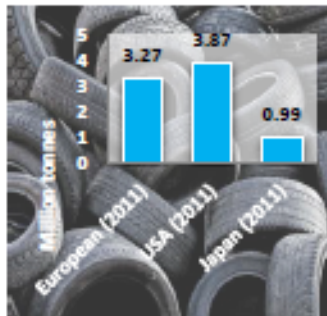


CARBON NANOTUBES AS VALUE ADDED PRODUCTS ALONG WITH HYDROGEN PRODUCTION BY PYROLYSIS CATALYTIC-GASIFICATION OF WASTE TYRES

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Problems of scrap tyres

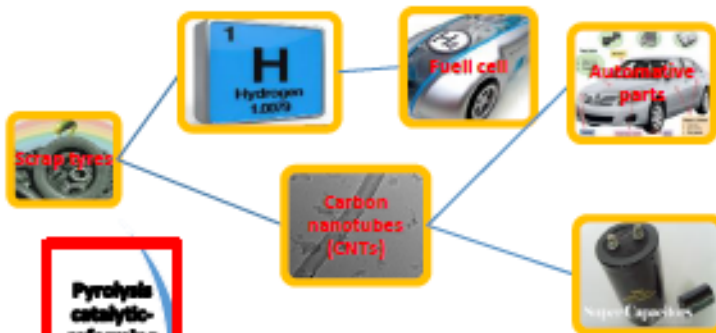
Disposal issues have emerged because of the large amounts of scrap tyres produced every year.



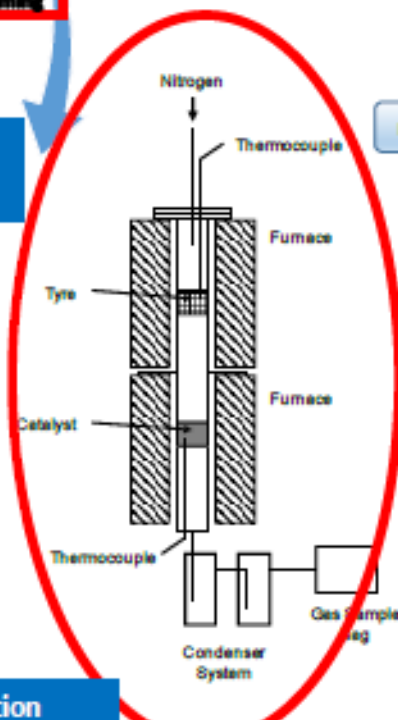
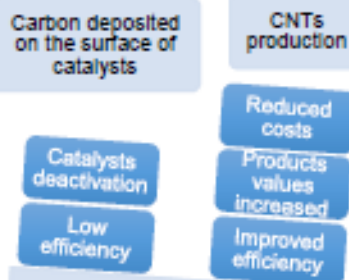
Solution: pyrolysis catalytic-reforming

Various applications

Two stage fixed-bed reactor



Benefits of CNTs production from pyrolysis catalytic-reforming

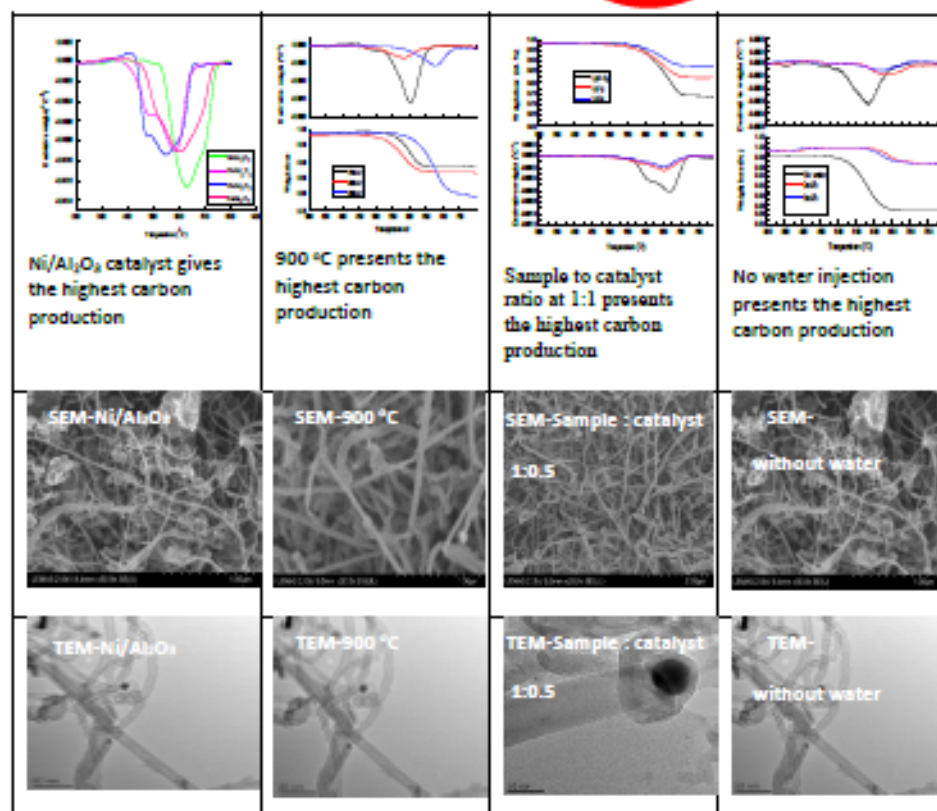


Investigations of process conditions

Catalysts	Temperatures	Sample: catalyst ratio (S:C)	Water injection rate
Ni/Al ₂ O ₃ 43.54mg/g CNTs	700 °C	1:0.5	No water
Fe/Al ₂ O ₃	800 °C	1:1	2 ml/h
Co/Al ₂ O ₃	900 °C	1:2	5 ml/h
Cu/Al ₂ O ₃			

Highest carbon (mg/g):	80	130	270	80
Highest H ₂ (mmol/g):	11	18.02	27.41	34.69

Characterisation of Carbon production



Why hydrogen and carbon nanotubes?

Two-stage pyrolysis-catalysis reactors have been used to enhance hydrogen production from waste tyres with the catalyst used to improve the efficiency of hydrogen production. Catalysts are commonly used for hydrogen production. However, catalysts become deactivated due to the deposition of carbonaceous coke on the catalyst surface, adversely influencing hydrogen production. Therefore, the problem of catalyst coke formation during hydrogen production, may in fact be a benefit if carbon nanotubes can be produced in addition to the co-production of the hydrogen. Additionally, using waste tyres as the feedstock for the process means that a problematic waste is turned into an attractive process solution producing valuable carbon nanotubes and hydrogen as resource recovered products.

Reference

Zhang, Y., et al., *Pyrolysis-Catalytic Reforming/Gasification of Waste Tyres for Production of Carbon Nanotubes and Hydrogen*. *Energy & Fuels*, 2015, 29(5): p. 3328-3334.

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