# A process for simultaneous removal of unsaturated hydrocarbons and hydrogen chloride from pyrolysis gas

Overview

The non-condensable pyrolysis gas from plastic pyrolysis is a suitable fuel and precursor for chemical synthesis. However, prior to downstream applications, the selective removal of unsaturated hydrocarbons and corrosive gases is required. A catalytic process is developed that decomposes ~99% of olefins, dienes and alkynes without significantly affecting the content of alkanes, and removes HCl from the gas to undetectable levels. After the catalytic process, product gas has composition similar to reformate fuels and can be utilized for power generation in solid oxide fuel cells. High value multi-walled carbon nanotubes (MWCNTs) are generated as a by-product of the process.

Key features

◔ A bifunctional catalytic/sorption process for simultaneous removal of hydrogen chloride and unsaturated hydrocarbons such as acetylenes, dienes and olefins from non-condensable gases produced from pyrolysis of plastic waste.

◔ The process removes >99% of HCl and decomposes >99% of unsaturated hydrocarbons such as olefins, dienes and acetylenes.

◔ The catalytic sorbent is selective towards the decomposition of unsaturated hydrocarbons leaving alkanes in the gas stream.
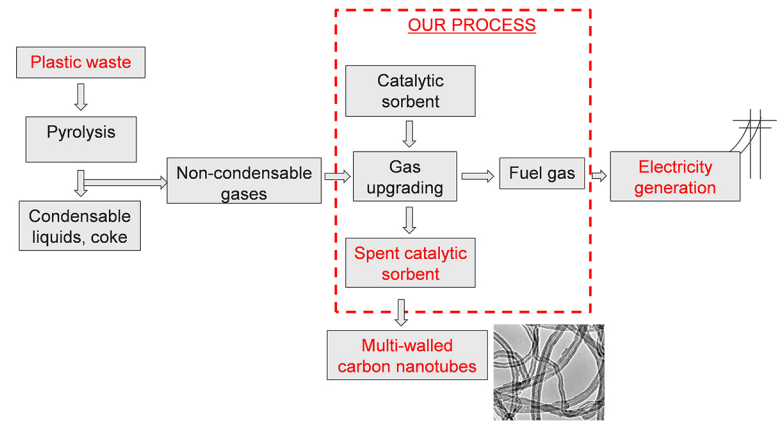
Applications

◔ Purification of the pyrolysis gas to produce a fuel for gas engines, gas turbines and fuel cells.

◔ Commercial recycling of plastic waste to produce carbon nanomaterials.

◔ Plastic wastes can be converted into gaseous feedstock for chemical synthesis (e.g., methanol, Fischer-Tropsh fuels).

Market opportunities

◔ Plastic recycling (e.g., plastic-to-oil, energy and carbon nanomaterials).

◔ Power generation (fuel cells, gas engines and gas turbines).

Advantages and benefits

◔ Removes HCl and decomposes unsaturated hydrocarbons in one-step, reduces equipment needs and plant space.

◔ Does not require steam or oxygen input, reducing the cost associated with a steam generator or air separation unit.