PYROLYSIS OF PERSONAL PROTECTION EQUIPMENT WASTE

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Used surgical masks and nitrile gloves represent the most common personal protective equipment (PPE) waste posing environmental and pollution issues. PPE waste ends up often in landfills or requires incineration due to the lack of dedicated recycling technologies. Nevertheless, PPE waste represents an excellent raw material for fuels/chemicals production via reverse engineering due to their high hydrogen and carbon content and high heating value [1].

Pyrolysis, the decomposition of organics in absence of oxygen under temperatures around 400-600°C is gaining attention as alternative disposal technique for PPE due to its flexibility, high conversion efficiency, lower environmental impact (compared to incineration) and the possibility to generate valuable products like hydrocarbons rich oils to enter refineries for further hydro-processing [2]. Despite many works have been produced on face masks and plastic waste pyrolysis in the past few years, there is lack of knowledge on the pyrolysis products of mixed nitrile gloves/masks and how pyrolysis conditions affect their yield, oil composition; in addition, the synergistic pyrolysis mechanism requires further investigation [3-5].

This work, which stems out from a recent collaboration between Heriot-Watt University and Globus Group, the largest provider of PPE in the UK, aims to (i) evaluate the slow pyrolysis of face masks and nitrile gloves under different temperatures, gas residence times and feedstock compositions and (ii) discuss the main challenges for the PPE waste pyrolysis oil applications. The work discusses the value of the technology as well as the challenge of emitting harmful gases (e.g. HCN, HCl) that poses great threat to the public health and the environment and the presence of undesired contaminants in the oils (e.g. metals, N, S, PAHs), which limits their access to refinery settings.

References:
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