

## Polymers with Anti-Microbial Properties

A new way to manufacture plastics with anti-microbial properties

### Proposed Use

This invention proposes a method to attach an anti-microbial agent to a polymer chain. Specifically, the anti-microbial agent is blended into a polymer matrix through melt blending. The polar anti-microbial agent will repel the non-polar polymer matrix and diffuses to the surface and thereby providing anti-microbial activity at the surface of the polymer.

### Problem Addressed

Existing approaches to adding anti-microbial properties to polymers usually do so through post-functionalisation of polymer surfaces. This involves modifying the polymer surface and attaching anti-microbial agents to the surface. Disadvantages of this technique including leaching of the active agent through wear and tear and the gradual deactivation of the surface.

### Technology Overview

A unique method has been developed to attach an anti-microbial agent to a polymer chain via a chemical bond. Due to entanglement of the polymer chains, the anti-microbial agent is chemically and physically attached to the polymer matrix and no leaching of the active anti-microbial agent will occur.

This anti-microbial polymeric material can be added to an existing polymer via extrusion, in the same way that other additives such as anti-static agents, dyes or flame-retardant agents are added to polymers. Examples of said anti-microbial polymeric agents can be seen in Figure 1 below. Specifically, quaternary ammonium salts or chlorhexidine will be bonded with polyolefin chains to synthesise an anti-microbial polymer additives that could inhibit or kill E.coli.

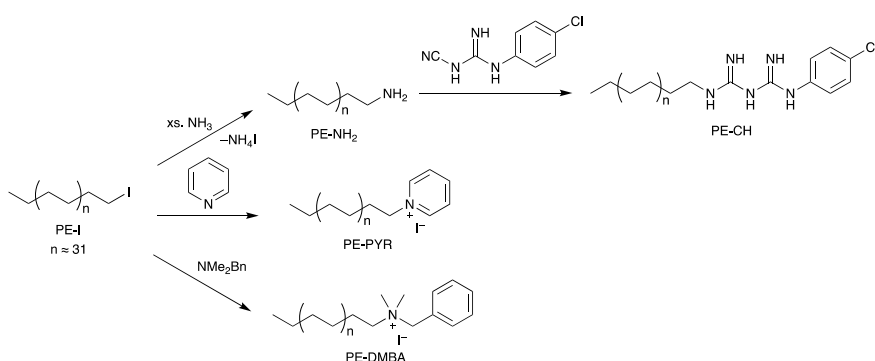


Figure 1 illustrates synthesis of PE-N-(4-chlorophenyl)-N'-alkylimidodicarbonimidic diamide (PE-CH), PE-dimethylbenzylammonium iodide (PE-DMBA), and PE-pyridinium iodide (PE-PYR).

### Benefits

- Simple process to form a covalent bond between polymer and anti-microbial agent. The polar anti-microbial agent will repel the non-polar polymer matrix and diffuses to the surface and thereby providing anti-microbial activity at the surface of the polymer.
- Permanent entanglement of the antimicrobial agent within the PE matrix during melt blending and thereby minimize the risk of leaching of the active antimicrobial agent into the environment.
- Easy adaptation to the existing manufacturing process. Only one additional extrusion process is added to the existing process in the same way that other additives such as anti-static agents, dyes or flame-retardant agents are added to polymers.

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Technology reference: 10853

**Intellectual property information**

GB Patent Application No. 2401660.2

**Link to published paper(s)**

N/A

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