

## Characterization and Antimicrobial Properties of Functional Polypropylene Films Incorporated with AgSiO<sub>2</sub>, AgZn, and AgZ Useful as Returnable Packaging in Seafood Distribution

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**Abstract :** Active antimicrobial films prepared by incorporating AgSiO<sub>2</sub>, AgZn, and AgZ at 1%, 3%, 5%, 10% (w/w) into polypropylene (PP) matrix. Complete thermal, structural, mechanical and functional characterization were carried out of all formulations and determined the antimicrobial efficiency and returnable antimicrobial efficiency according to the Japanese Industrial Standard method. The morphology of the films showed agglomerates of particles in the composites. The active formulation had decreased elongation compared to the pure PP sample. Thermal analyses indicated that the active formulation compositions had increased thermal stability. The films showed 50% antimicrobial properties after the fifth wash against the tested microorganisms, presenting better activity against Gram negative organisms than Gram positive ones. These findings suggest that PP films with AgSiO<sub>2</sub>, AgZn, and AgZ particles could provide a significant contribution to the quality and safety of seafood in the distribution chain.

**Keywords :** antimicrobial film, properties and characterization, returnable packaging, sea food

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