# Research shows pulsed light is a fast and sustainable technology for packaging sterilization

## Overview

A research collaboration in Taiwan between the Department of Food Science at Fu Jen Catholic University and the Food Industry Research and Development Institute has investigated pulsed light as a disinfection method for food packaging. Traditional methods of sterilization (such as heat, chemicals, or irradiation) can face limitations of effectiveness, energy consumption, or chemical residue. To address these challenges, researchers explored pulsed light as an alternative.

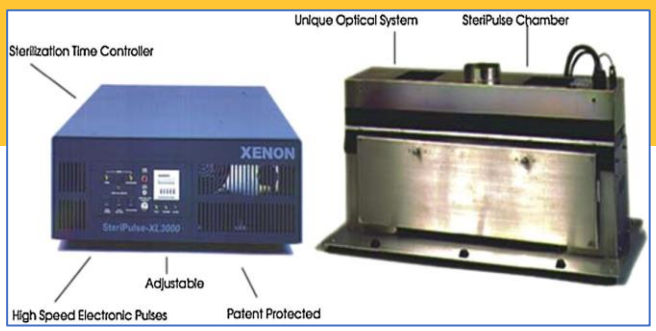
Using a custom XENON benchtop pulsed light system, researchers examined how pulse energy, pulse width, and the number of pulses effected sterilization efficacy. They also evaluated the chemical and physical impact of pulsed light treatment on the integrity of the packaging materials. The study provided insights of pulsed light's potential to be a more efficient and sustainable sterilization method for industries that rely on safe packaging.

## Markets/Applications

- Food & Beverage: Ensure safety and extended shelf life of perishable products.
- Cosmetics & Personal Care: Cosmetics, lotions, creams, and other personal care products can benefit from pulsed light sterilization by eliminating bacteria, viruses, and fungi.
- Agriculture & Horticulture: Fruits, vegetables, and flowers to enhance the post-harvest quality and extend the shelf life of perishables.
- Pharmaceutical: Ensure consumer safety and regulation compliance, preserving the integrity of pharmaceutical packaging.

## Highlights

- Sustainable and responsible method that does not involve harmful chemicals or generate toxic residues
- Effective microbial reduction on various packaging and surface materials including paper, plastic, and glass
- Suitable for high-speed production with treatment times as short as a few seconds
- Broad spectrum of antimicrobial activity, eliminating a wide range of microorganisms
- Treatment did not deteriorate the packaging materials, preserving their structural integrity and functionality




***"Research using a custom XENON benchtop pulsed light system demonstrated that pulsed light sterilization is a promising and efficient method for many packaging materials."***

The information in this report was prepared by XENON and does not contain the complete research conducted by Bang-Yuan Chen et al. A full version of the research paper is available at https://www.sciencedirect.com/science/article/abs/pii/S2214289415000472

Summary of Research

# Pulsed light sterilization of packaging materials

*Original research by Bang-Yuan Chen, Hsiang-Mei Lung, Binghuei Barry Yang, and Chung-Yi Wang Nicholas X. Williams, Justin H. Qian, Karl W. Putz, Christopher E. Tabor, and Mark C. Hersam*

**Objective**: Investigate the effectiveness of pulsed light sterilization for packaging materials and evaluate its potential as an alternative to traditional (e.g., chemical or thermal) disinfection techniques.

**Methodology**: Experiments were conducted using a XENON Corp custom benchtop system. The system was complete with a treatment chamber and control module. Pulsed Light was emitted using a xenon gas lamp.

A wide range of packaging materials commonly used in the food industry was selected for testing, including polypropylene (PP), polyethylene terephthalate (PET), and polylactic acid (PLA). The materials were exposed to pulsed light treatment for varying durations and intensities. The researchers established a control group that was not subjected to pulsed light treatment for comparison.

Sterilization results were assessed by measuring microbial reduction on the testing materials. Microbiological analysis determined the levels of total aerobic bacteria and specific pathogenic bacteria before and after the pulsed light treatment. The researchers also examined the impact of pulsed light treatment on the physical and mechanical properties of the packaging materials, such as color changes and tensile strength, to evaluate any potential adverse effects.

**Results and Conclusions**: Results showed pulsed light treatment led to significant reductions in total aerobic bacteria and specific pathogenic bacteria, providing a means to enhance the microbial safety of packaging materials. The effectiveness of the treatment depended on factors such as the type of packaging material, treatment duration, and intensity. The findings suggest pulsed light sterilization has the potential to be a sustainable alternative to traditional methods of sterilization in the packaging industry. It offers advantages such as shorter treatment times, non-thermal nature, and absence of chemical residue. These findings have implications for various industries that rely on sterile packaging, including food and beverage, pharmaceuticals, and medical devices, where maintaining product integrity and safety is critical.

The Pulsed Light Experts

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