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Review Article

HIGH INTENSITY PULSED LIGHT TECHNOLOGY IN FOOD PROCESSING

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Synonym: Pulse pure technology

Introduction

Rapid and effective low thermal, low energy purification and sterilization technique by use of very high power and short duration light pulses emitted by inert gas flash lamps. Limited to treatments of very transparent foods, surface treatments and for food packaging's. It cannot be used for solid foods.

History

Discovery of bactericidal effect of continuous UV light by (Jagger, 1967; Smith, 1977). Invention of inert gas flash lamps as generating intense and brief pulses of UV light as a technique of microbial inactivation (Hiramoto, 1984) in Japan. Used as technique of decontamination and sterilization for various Medical and Dental Instruments, Devices, Packages, Surfaces (or) Atmospheres Of Labs, Hospitals and wherever there requires a high degree of cleanliness (Barbosa-Canovas *et al*., 1999)

Principle

(Ultra-violet-180 to 400 nm, Visible light- 400 to 700 nm, Infra-Red-700 to 1100nm) Ultra-violet rays of short wave-length and high energy were used and with total energy being equal power provided by pulses is greater than that provided by continuous light (Dunn *et al*.,1989)

Mechanism of inactivation

The mechanism of microbial inactivation by ILP is mainly explained through the photochemical effect, which includes chemical modification and cleavage of DNA, protein denaturation and other alterations of cellular materials, thus preventing cells to replicate (Anderson *et al*., 2000; Frankas, 1997). Photothermal and photophysical effects have been also proposed to explain mechanism of inactivation during the ILP treatment (Krishnamurthy *et al*., 2007).

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Requirements of PLT

	Source factors	**Target factors**
1.	Transparency of light	Product
2.	Electrical density	Colour
3.	Duration	Size
4.	No of pulses	Smoothness
5.	Interval between pulses	Cleanliness of surface

These parameters should be considered to avoid undesirable photochemical reactions of food and food packaging materials.

Spectral distribution-source

Of the Electromagnetic spectrum the UV light is the cause of microbial inactivation by photochemical and photo thermal effect (Dunn *et al.,* 1995). The Emission of UV light by Inert gas lamp is strongly dependent on the current. As like HPP and PEF, PLT depends strongly on current density for emission of UV pulsed light. Time duration of exposure: 1µS to 0.1 S. Between Pulses time : <2mS about 1 to 20 pulses/second (Dunn *et. al.*,1989).

Target

Products of greater transparency with greater UV absorption coefficient shows better inactivation so its the reason for the use of UV rays in water treatment and not used in sugar, wine, beer etc. Besides transparency surface used should be smooth and clean without any pores to avoid shadowing effect on microbes. Selective inactivation of microorganisms with varying wave length (Mertens and Knorr, 1992). Polymers such as polyethylene, polypropylene, nylon, EVA, EVOH, transmits UV light on the other hand glass, PET, polystyrene does not allows UV light (Anonymous 2000).

Effects of PLT on food quality

Causes loss of riboflavin and other nutrients remains same, significantly destroys the spoilage enzymes, maintains sensory attributes as such (Dunn *et. al*., 1989).

Commercial status

In most cases pulsed light treatment does not modify the treated product, and in that case legal approval is much suppler. However, an analytical study must prove this for each new application. Suggestions made elsewhere that PLT treated foods need to comply with legal framework designed for radiation-treated foods (Koutchman *et al*., 2009) does not seem plausible.

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