
Fundamental principles of pulsed light technique in food preservation: Mini review

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ABSTRACT

Recently, emerging of new nondestructive technology along with increasing rate of consumer expectations regarding using of as much possible as consuming fresh material with no human manipulation has become developed. In this mini review, overall principles of pulsed light treatment are studied and introduced as one of the effective novel method of preservation.

Keywords: pulsed light, food preservation, keeping quality

INTRODUCTION

Growing interest of consumers about keeping foodstuff quality, organoleptic properties and minimally processed food materials has led to gain more increasing in non-thermal and nondestructive food preservation techniques [1]. There are several non-thermal processes including osmotic dehydration, radio frequency electromagnetic, pulsed light and so forth with superiority of having mild affections compared to conventional food preservation methods [2]. In regards to commercialization of these novel methods, they require a change in designing of packages [3,4]. A packaging system must include all constituents such as protecting, promotion the brand, all functions related to storing conditions etc i.e. all developed requirement in the past and today's ones.

To all classical and modern processes of food preservation, except in canning foods, packaging is only possible when processed of food is finished. Therefore recently, need to a technique which makes possible inside package processing with no contact and contamination in surrounded environment or medium has considered intensely in researches. Some important parameters must be taken into accounts are volume and temperature in case of using high hydrostatic temperature as prerequisites of those complicated processes. Thus all interactions of polymer packs multilayer laminates, product-package shall considers fulfilling required development of treatment concepts.

Fundamental of pulsed light application

Among emerged method of preservation, pulsed light is one with ability of leaving as less as possible damage to nutrients. It is involve using short pulses to guarantee that surface is disinfected.

Pulsed light system is composed of 3 constituents: power supply, lamp and configuration device. High energy is received in the lamp leading to an intense pulse which typically lasts a few hundred microseconds. Produced light includes wavelength from UV (180-380nm) to NIR (700nm).

The assessment of pulsed light efficacy is determined by 3 main factors matrix, contaminating micro flora and processing parameters. From the viewpoint of achieving to optimized status, liquids are restricted to surface disinfection and semi solids are evaluated via their matrix capacity of absorption light [2].

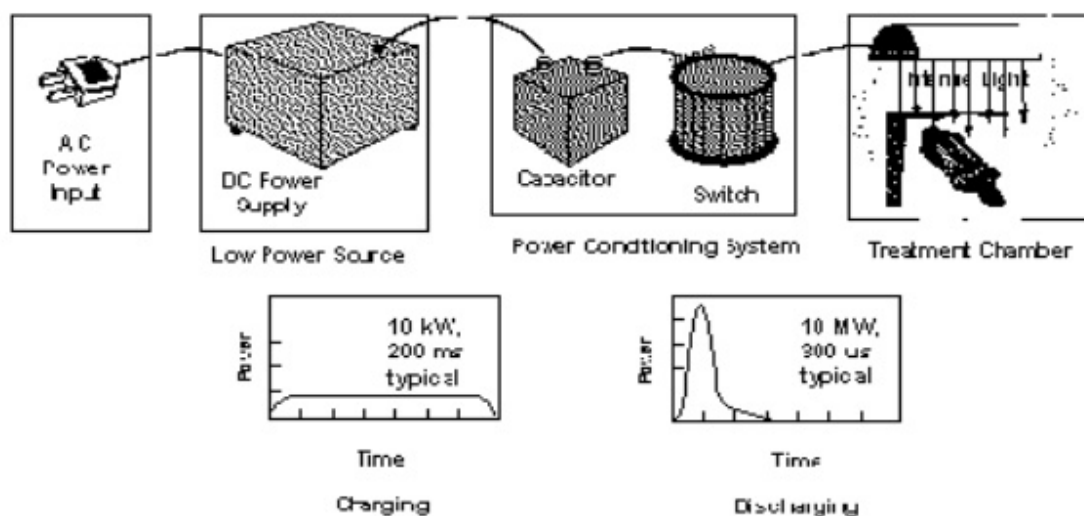


Figure 1: schematic of pulsed lighting system

Present of pronounced competitive light absorbing materials such as fat and protein on the surface of matrix must be in its lowest level [5].

Regarding the susceptibility of Microorganisms several parameters such as thickness of cell wall, population of micro flora & their physiology are important. (i.e. it can be said their follow this paradigm: fungi> spores> vegetative bacteria> smaller bacteria based on dissipation heat from the surface.

It is suggested that immediately after taking place of contamination pulsed light treatment apply due to impair efficiency of disinfecting as a result of high population density of microorganisms [9] (Rajkovic, Tomasevic, et al., 2010). Respective situation of fluency rate and itself, the number of pulses, frequency etc is needed to adjust if proper decontamination has targeted [2]. To prevent occurring surface burning from pulsed light method, a cooling system via creating appropriate cooling period among pulses is recommended i.e. shorter distances, higher pulsed light affection on surface takes. Theatrically, this technique has own benefits and desirability but industrially viewing to use this emerged technique in factory is a questionable issue because of its possibility in applying in different levels.

CONCLUSION

Pulsed light techniques is high recommended technique in preserving foodstuff with the highest possibility in keeping nutrient. Along its fundamental intense reviews are remained in its functionality in different groups of food material.

REFERENCES

- [1] D. Knorr, A. Froehling, H. Jaeger, K. Reineke, O. Schlueter and K. Schoessler, *Annual Review of Food Science and Technology*, **2011**, 2(1), 203–235.
- [2] L. Palmieri, and D. Cacace, High intensity pulsed light technology. In D. -W. Sun(Ed.), *Emerging technologies for food processing*, **2005**, (pp. 279–306). London: ElsevierAcademic Press.
- [3] J. H. Han, New technologies in food packaging: Overview. In J. H. Han (Ed.), *Innovations in food packaging* , **2005**, (pp. 3–11). Elsevier Ltd.
- [4] J. H. Han, Packaging for nonthermally processed foods. In J. H. Han (Ed.), *Packaging for non-thermal processing of food*, **2007**, (pp. 3–16). Blackwell Publishing Professional.
- [5] A. Rajkovic, N., Sigmatic, and F. Devlieghere, *International Journal of Food Microbiology*, **2010**, 141, S29–S42.