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Drying Characteristics of Aloevera and Curry leaves using microwave

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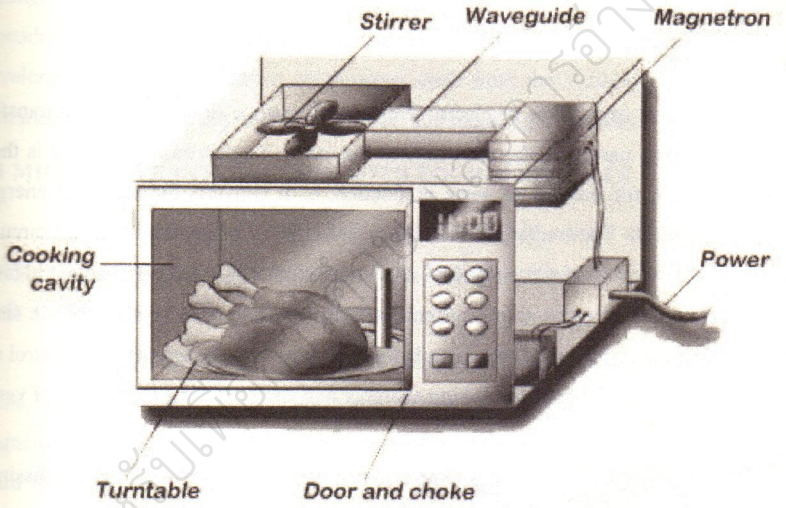
CHAPTER 1

INTRODUCTION

MICROWAVE OVEN

A microwave oven is a kitchen appliance that heats food by dielectric heating. This is accomplished by using microwave radiation to heat polarized molecules within the food. This excitation is fairly uniform, leading to food being more evenly heated throughout (except in dense objects) than generally occurs in other cooking techniques.



1.1 HISTORY

The microwave was discovered during the Second World War by Dr. Percy Le Baron Spencer, an American engineer who was working on special waves that were to be used in radars. After a particular experiment, Spencer noticed that some of the candies in his pocket had become hot, to the extent of melting. This discovery was later on used to make the microwave

ovens that we use today. The first personal microwave was introduced in 1967 by the Amana Corporation. . The microwave has developed at an amazing speed, and within a time span of 50 years, it has become an indispensable house hold appliance.

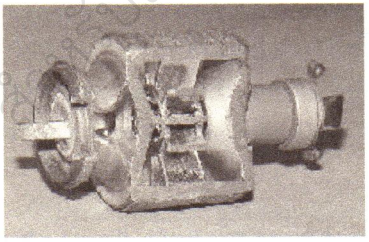
1.2 DESCRIPTION OF A MICROWAVE OVEN

Microwave oven consists of:

- a high voltage power source, commonly an electronic power converter, which passes energy to the magnetron
- a high voltage capacitor connected to the magnetron, transformer and via a diode to the case.
- a cavity magnetron, which converts high-voltage electric energy to microwave radiation
- a magnetron control circuit (usually with a microcontroller)
- a waveguide (to control the direction of the microwaves)
- a cooking chamber

1.3 PRINCIPLES

A microwave oven takes in electrical energy through a simple electricity transformer. The transformer then passes on the electricity to the cavity magnetron. This device is the most important device in the process of wave production, as it converts the electrical energy into microwave radiation. The radiation then goes through a magnetron control circuit and waveguide, where the waves are controlled and directed into the cooking chamber. This basic process is surrounded by many safety systems such as the door safety system, which shuts off the wave production, if the door of the oven is suddenly opened. The temperature control system controls the temperature within the cooking chamber and shuts off the oven in case of very high temperature.



The microwave works by passing non-ionizing microwave radiation, usually at a frequency of 2.45 gigahertz (GHz) - a wavelength of 122 millimetres (4.80 in)—through the food. Microwave radiation is between common radio and infrared frequencies. Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a positive charge at one end and a negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. This molecular movement

represents heat which is then dispersed as the rotating molecules hit other molecules and put them into motion.

Microwave heating can cause localized thermal runaways in some materials with low thermal conductivity, where dielectric constant increases with temperature. Under certain conditions, glass can exhibit thermal runaway in a microwave to the point of melting.

A common misconception is that microwave ovens cook food "from the inside out," meaning from the centre of the entire mass of food outwards. In reality, microwaves are absorbed in the outer layers of food in a manner somewhat similar to heat from other methods. The misconception arises because microwaves penetrate dry non-conductive substances at the surfaces of many common foods, and thus often induce initial heat more deeply than other methods. Depending on water content, the depth of initial heat deposition may be several centimetres or more with microwave ovens, in contrast to boiling (infrared) or convection heating, which deposit heat thinly at the food surface. Penetration depth of microwaves is dependent on food composition and the frequency, with lower microwave frequencies (longer wavelengths) penetrating further. Microwaves cook from the inside out only in the sense that each molecule is generating heat from "inside" and radiating it "outward".

1.4 MICROWAVE INTERACTION WITH FOOD MATERIALS

Basic microwave ovens heat foods quickly and efficiently, but, unlike conventional ovens, do not brown or bake food. This makes them unsuitable for cooking certain foods, or to achieve certain culinary effects.

Most microwave ovens allow users to choose between several power levels. In most ovens, however, there is no change in the intensity of the microwave radiation; instead, the magnetron is turned on and off in duty cycles of several seconds at a time. This can actually be heard (a change in the humming sound from the oven), or observed when microwaving airy foods which may inflate during heating phases and deflate when the magnetron is turned off. For such an oven, the magnetron is driven by a linear transformer which can only feasibly be switched completely on or off. Newer models have inverter power supplies which use pulse width modulation to provide effectively-continuous heating at reduced power so that foods are heated more evenly at a given power level and can be heated more quickly without being damaged by uneven heating.

The cooking chamber itself is a Faraday cage which prevents the microwaves from escaping. The oven door usually has a window for easy viewing, but the window has a layer of

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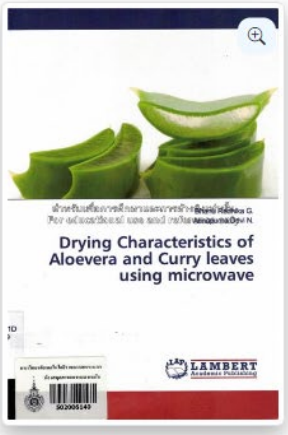

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