

# Microwave Processes

## Introduction OF Microwave:

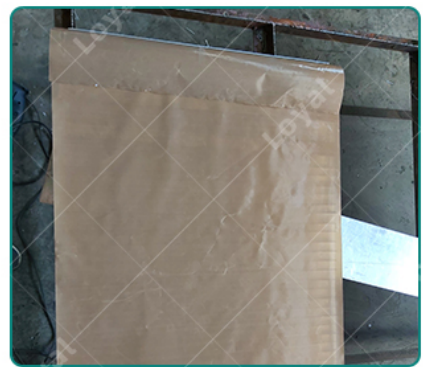
Microwave frequencies are part of the electromagnetic spectrum, which includes a range of electromagnetic waves with different frequencies, wavelengths and energies. Microwaves are generally defined as electromagnetic waves with frequencies between 300 MHz and 300 GHz, with corresponding wavelengths ranging from 1 m to 1 mm. With the development of modern microwave technology, sub-millimetre waves with wavelengths below 1 mm are also considered to be microwaves, which corresponds to a further extension of the frequency range of microwaves to higher frequencies. Therefore, the frequency range of microwaves is also defined in some literature as 300 MHz to 3000 GHz.



## The Working Principle Of Microwaves:

Microwave is a high frequency electromagnetic wave, which itself does not produce heat, in the universe, there are

microwaves everywhere in nature, but the existence of nature's microwave, because of the dispersion is not concentrated, so can not heat materials. Microwave oven is the use of its internal magnetron, the electrical energy into microwave, with 2450MHZ per second oscillation frequency through the material, when the microwave is absorbed by the material, the polar molecules of the material (such as water, fat, protein, sugar, etc.) is attracted to the speed of 2.45 billion times per second rapid oscillation, so that molecules collide with each other and generate a lot of frictional heat, microwave equipment is the use of this by the Microwave equipment is the use of such frictional heat generated by the material molecules themselves, inside and outside the rapid heating of materials. Microwaves are reflected when they touch metal, which has no way to absorb or conduct it; microwaves can pass through glass, ceramics, plastics and other insulating materials, but will not consume energy; and materials containing moisture, microwaves not only can not pass through, but its energy will be absorbed, which can be understood as rapid frictional heat.



## **Microwave Working Characteristics:**

### **1.Heating speed:**

Conventional heating depression from the outside of the heated object into the internal; microwave heating is to make the heated object into a heating body, no heat transfer process, microwave penetration from all sides of the object inside and outside at the same time so that the object in a very short period of time to achieve uniform heating sterilization, greatly shorten the drying time of the bacteria, improve the yield. Uniform heating: conventional heating, in order to improve the heating acceleration, it is necessary to raise the heating temperature, easy to produce external scorching and internal raw phenomenon. Microwave heating, all parts of the object usually part can evenly penetrate electromagnetic waves, generating heat, so uniformity greatly improved.

### **2.Energy-saving and efficient:**

In microwave heating, microwave energy can only be absorbed by the heating system body and heat, the heating chamber and the corresponding container will not heat up, so the thermal efficiency is very high, the production environment is also significantly improved. Compared with far infrared heating can save 30% of electricity.

### **3.Low-temperature sterilization, no pollution:**

Microwave itself will not contaminate the food, and the microwave potential effect of dual bactericidal effect can kill bacteria at a lower temperature, is a kind of heating and sterilization methods to maintain the nutritional composition of food.

### **4.Selective heating:**

Microwaves have different effects on different properties of materials, because the water absorption of the best microwave,

so the high water content of the parts of the absorption of the forging wave power more F low water content of the parts of this is the characteristics of selective heating. Drying wood, paper and other products, the use of this feature can be evenly heated and uniform drying.

### **5.Easy to control, advanced technology:**

Compared with conventional methods, the equipment is ready to use: no start inertia, flexible and convenient operation: microwave power adjustable, adjustable transmission speed. In the microwave heating and drying sterilization, no degree of water, waste gas, waste residue, radiation, is a safe and harmless high-tech.

## **Microwave Technology In Industry Applications:**

### **1.Heating and drying:**

Microwaves are used in the food industry for heating and drying processes, such as thawing frozen foods, cooking and pasteurization. They are also used in the paper, textile and pharmaceutical industries for drying and curing materials.

### **2.Sterilisation:**

Microwaves are used for sterilisation in the medical and dental fields, where they are used to kill bacteria and viruses on medical equipment and instruments.

### **3.Materials processing:**

Microwaves can be used to process materials such as ceramics, polymers and metals. They can be used for sintering, brazing and soldering, as well as joining different materials.

### **4.Chemical reactions:**

Microwaves can be used to catalyse chemical reactions, such as the production of biodiesel and the synthesis of



pharmaceuticals.

### **5.Communication:**

Microwaves are used for communication purposes, such as mobile phones, satellite communications and radar systems.

### **6.Microwave-assisted extraction:**

Microwaves are used to extract natural products from plant materials, such as essential oils. This process is faster and more efficient than traditional extraction methods.

### **7.Waste treatment:**

Microwaves can be used for waste treatment, such as the decomposition of organic waste and the disinfection of medical waste.

Overall, microwave technology has become an essential tool in many industrial processes, offering advantages such as speed, efficiency and cost effectiveness.

