

Module 9 Microwave Drying

Dr. Vivek Kumar

Department of Agricultural Engineering

School of Agricultural and Bio-Engineering

Centurion University of Technology and Management Paralakhemundi

Dist. Gajapati, Odisha 761211

Fundamentals of Microwave heating

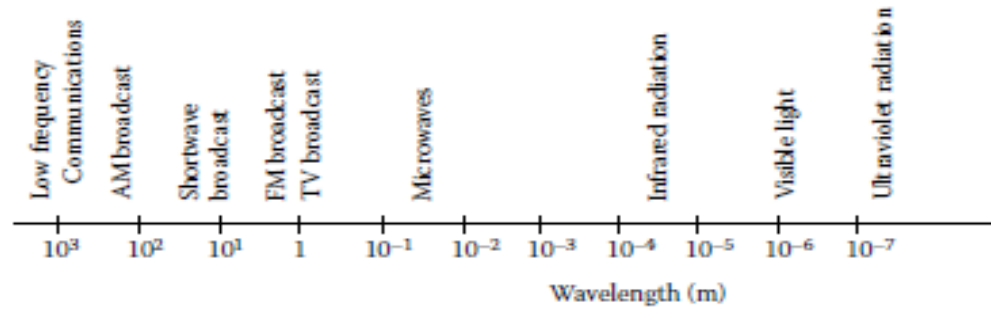


Fig. Electromagnetic Spectrum

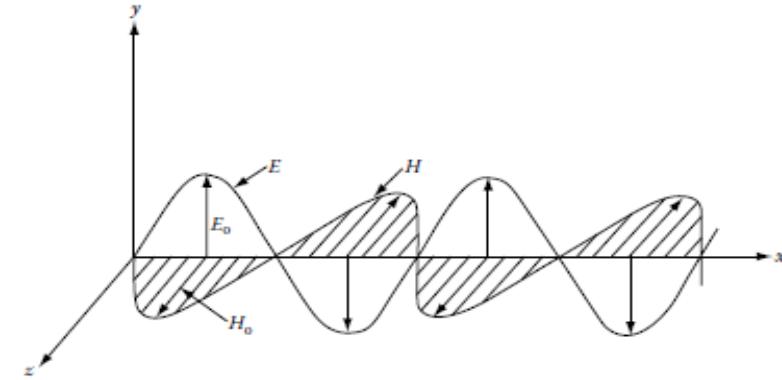


Fig. Diagrammatic illustration of a plane electromagnetic wave. E and H represent the electrical and magnetic components of the wave; E_0 and H_0 are their respective amplitude

Heating mechanism

(1) Ionic conduction

(2) Dipolar radiation

❖ Advantages of Microwave Drying

- Efficiency: in most cases, the energy couples into the solvent, not the substrate.
- Nondestructive: drying can be done at low ambient temperatures; no need to maintain high surface temperatures, leading to lower thermal profiles.
- Reduction of migration: solvent often mobilized as a vapor; therefore, it does not transfer other materials to the surface.
- Leveling effects: coupling tends toward the wetter areas.
- Speed: drying times can be shortened by 50% or more.
- Uniformity of drying: by a combination of more uniform thermal profiles and leveling.
- ConveyORIZED systems: less floor space, reduced handling.
- Product improvement in some cases: eliminates case hardening, internal stresses, and other problems.

Equipments for microwave heating and drying

- The basic components of these systems are a means of generating the HF energy (the generator) and a means of applying it to the workpiece (the applicator).
 1. Generators
 2. Applicators
 1. Dielectric systems
 2. Microwave systems
 3. Other devices
 1. Control Systems
 2. Leakage and safety control systems
 3. Protective devices

- Industrial applications of microwave and dielectric drying

- Guidelines for the selection of microwave

- Size of Load
 - Watt density
 - Power
 - Geometry
 - System compatibility
 - Self-regulation
 - Self limiting

Thank you