

Microwave Treatment for drying/curing of tow for excel fiber

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Background

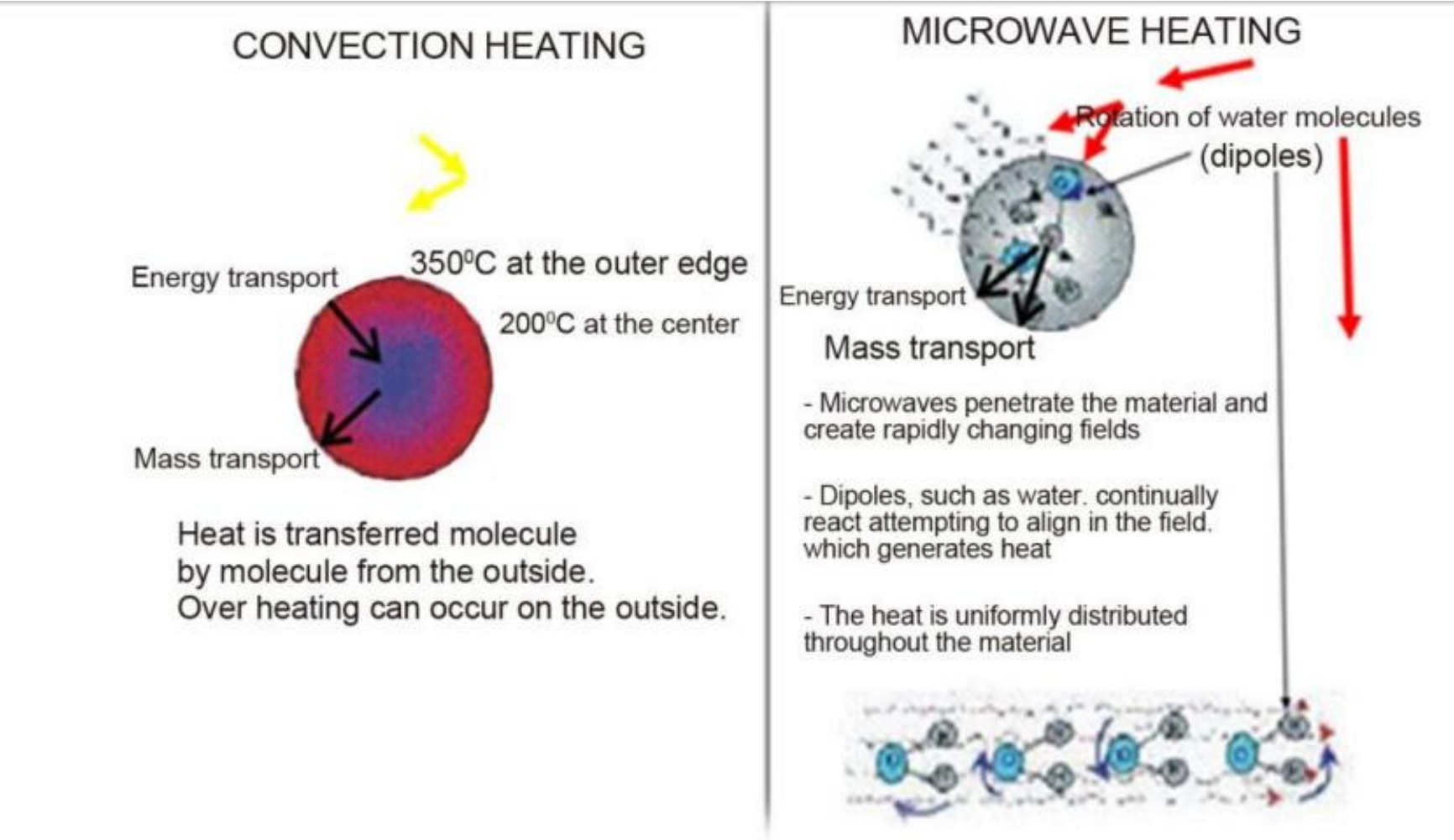
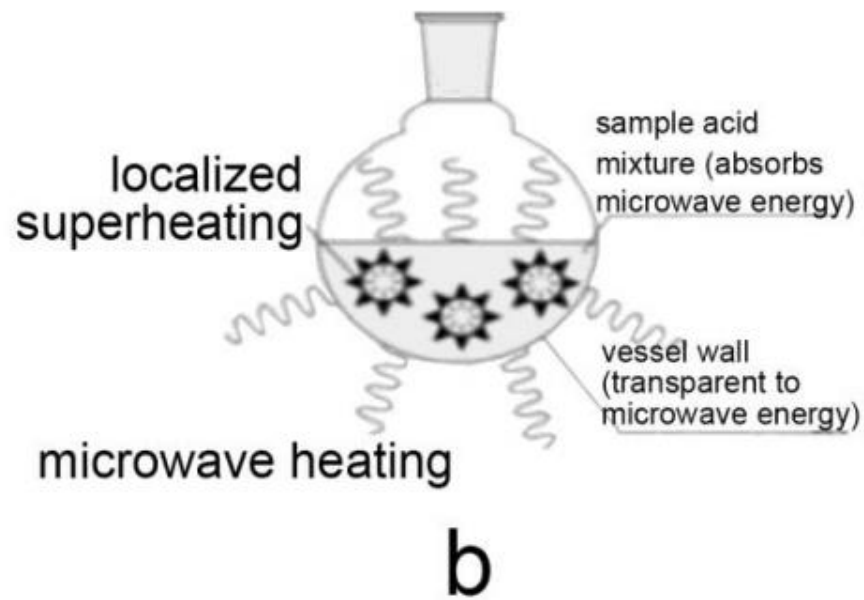
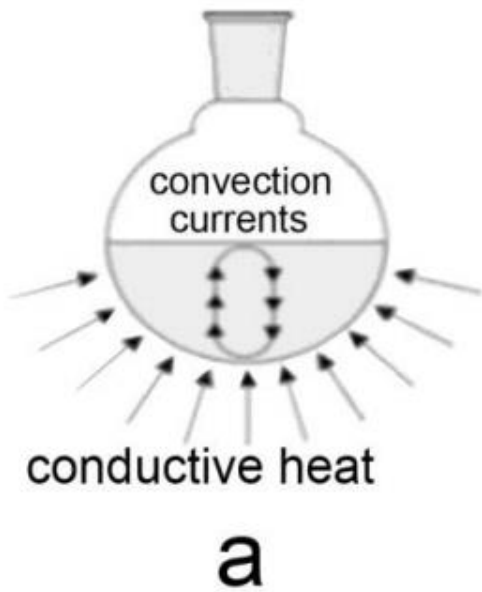


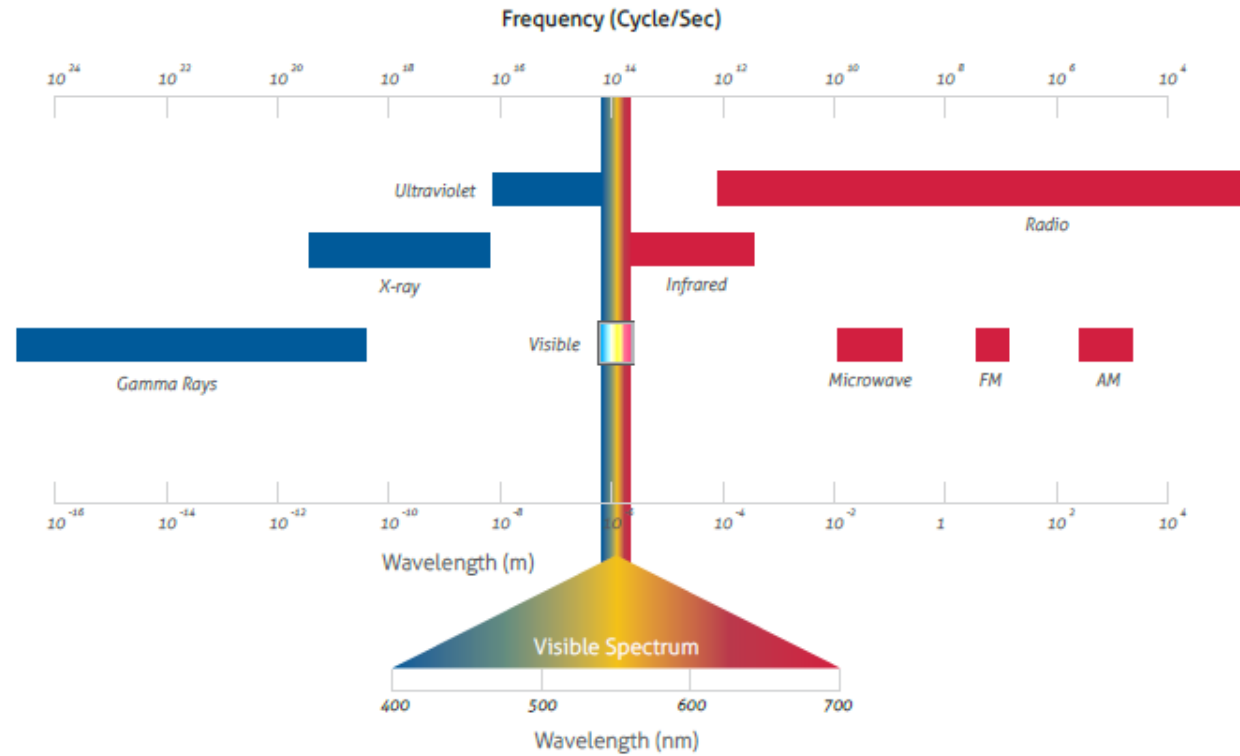
Fig. 1. Energy transfer comparison.

Background



Microwaves Heating System Classification

Microwave Frequency	Heater Type
915 Mhz	Batch
2450 Mhz	Continuous
	Hybrid



Microwave Heating System Vs Conventional Heating System

Microwave Heating System	Conventional Heating System
<ul style="list-style-type: none">• Microwave heating system is generates the heat very fast within material	<ul style="list-style-type: none">• Conventional heating system have slow hating rate, heat is transferred via means of air
<ul style="list-style-type: none">• Heating of materials are due to molecule movements hence no chamber warm up time is required	<ul style="list-style-type: none">• Instance heating does not takes place, it requires warm-up of surrounding
<ul style="list-style-type: none">• Environmental friendly and green heating solution, no carbon emission	<ul style="list-style-type: none">• Produces carbon or toxic gases hence not much environmental friendly heating solutions
<ul style="list-style-type: none">• 100% energy utilization, as heating takes place within the material	<ul style="list-style-type: none">• 100% energy utilization is not possible, as material is heated by surrounding hot air
<ul style="list-style-type: none">• Better floor utilization index as it doesn't require chamber area	<ul style="list-style-type: none">• Poor floor utilization index as it require bigger chamber area for material to rotate
<ul style="list-style-type: none">• No Temperature loss in surrounding, ambient workplace	<ul style="list-style-type: none">• Surrounding air temperature rises with rise in heater temperature

Microwave Heating System Vs Infrared Heating System

Microwave Heating System	Infrared Heating System
• Microwave heating systems utilizes electromagnetic system uses wavelength of about 1 centimeters	• IR heating systems utilizes electromagnetic system uses wavelength of about 0.01 centimeters
• Microwave heating systems does not require larges space hence offers better floor utilization index	• Compact system providing better floor utilization index
• Microwave heating systems are not substitute the conventional heaters	• Infrared heating systems are better substitution of traditional convention heaters
• Depth of heat penetration is higher in Microwave heaters	• Depth of heat penetration is lower in infrared heaters as it heats from surface
• Rate of heating depends on the moisture content within the material	• Rate of heating depends on the surface characteristics of material
• Heats the objects from within the object	• Heats the object from surface of object

Introduction to Continuous Microwave Heating Systems

MICROWAVE is a new technology for heating purpose. Application on heating industry such as rubber, food, kiln, ceramics, chemistry, lumber, paper, fiber, print and so on.

Features

- Speedy Drying: High temperature is reached in short time to save lot of drying time.
- Uniform Heating: Microwave penetrates to the core of the product and heat every part evenly to upgrade product quality.
- High Efficiency: Microwave is functioned for product direct heating to avoid energy absorbed by container for equipment invest cost down.
- Easy Control: Start and stop heating are functioned automatically for easy and safe operating.
- High Quality: Uniform heating to guarantee high quality products.
- Heating Under Vacuum Condition: Microwave can penetrate deeply into product core under vacuum condition.
- Articles Packed by Bag: Microwave can go through bag to heat articles inside.
- Small Space Required: Continuous and high efficiency working to minimize operating space.
- Good Working Environment: Free of hot and noise problem.



kerone/continuous-microwave-heating-systems

www.kerone.com/continuous-microwave-heating-systems.php

Microwave Dryer - Continuous Type

Can add to the performance of the machine by choosing from various additional optional features like Temperature control, Pulsating power, Hot air assisted RF / MW system, Heater temp control, Air assisted RF/MW system, Air velocity control, Vacuum assisted RF/MW system, Vacuum / pressure control, Alarm system after RF OFF, PLC base control system, Data logger with computer interface.



- ★ *Microwave Magnetron*
- ★ *Variable Frequency*
- ★ *PID Indicator / Controller*
- ★ *Variable Power output*
- ★ *Stainless Steel Chamber*
- ★ *Electrical & Thermal Safety Features*
- ★ *RF / MW Choke / Timer Provision*

Trial Plan at Vendor's site

Action plan:

List of work	Status	Remarks
Find suitable vendor	Done	One vendor identified in Mumbai, ready to do trials
Send sample for trials	Done	10Kg wet tow sent on 23 rd 09-2020
Trial-01, MW moisture drying	In planning and discussion	Trial will be conducted at Vendors site in Mumbai.
Trials-02, MW curing with CL		After data obtained from trial-01, trial-02 will be initiated
Scale up discussion		After successful trial-02, scale up, cost will be evaluated

Vendor's queries

1. Min/Max sizes (w x h) and respective weight (kgs/m) of the product.
23g/m for one line (sample A), there will be 128 lines in commercial set up
2. Throughput (kgs/hr).
30 to 40 meter per min
3. Product bulk density (Wet & Dry):
60-70%, 170-180%
4. Maximum temperature allowed for the drying:
110C to 145C
5. Total space available for the system (L x W x H):
For one tow: L= (depend on instrument and resident time), W = 2cm, H = 1cm (approx.).

- Sample sent to vendor (A): 10Kg 74K wet tow single tow
- Tow parameters: 1m = 8.8 g when dry
1m = 24g when wet (moisture on dry basis = 172%, & moisture on wet basis = 63%)
- Moisture will vary 5 to 15%

Trial-01:

Trial plan in MW treatment:

Line speed: 30-40 meter per minutes

Resident time: 2 to 10 minutes

Drying: From 175% (dry basis) to less than 5% (dry basis)

Temperature: 110C and/or 140C

Optimised condition in convection heating:

