ABOUT DIRECT POWER AND REFLECTED DISTRIBUTION IN MICROWAVE

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Abstract
The microwave heating is son alternative for the exceeding of the difficulties generated by the classical technologies, with a high energy consumption. Last year has determined the intensification of the concern for the microwave utilization in the heating processes with industrial applications. The experts foresee a progressive growth of the industrial utilization of the microwave owing to the microwaves technology improvements and inventions of the new technologies.

Key words: loss factor, microwave field, load.

INTRODUCTION

The known dielectric properties values and in special the loss factor „ε''” is important to elaboration the technologies in microwave and we must consider the power and the frequencies in microwave is dissipate in the given material volume (Foster K., Ayyaswamy P., 1982)

Also the dissipate power in microwave „ε''” is release by the microwave generator and is depend on the speed of growth in material temperature. (Hippel A., 1983)

The loss factor is growth, absorb material more microwave energy and produce the heating. (Lefeuvre S., 1982)

At the high frequencies corresponding to using domain of microwave energy we must to connect the generator and load to transmission line or wave guide.

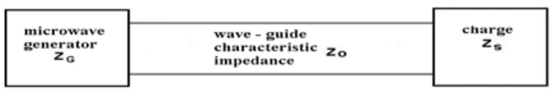

Fig. 1 The equal line in microwave generator, wave guide and load

MATERIALS AND METHODS

For a better functioning of the presented system we must to adopt the microwave generator impedance with guided wave impedance.

$$Z_G = Z_0$$

In similar mode the load impedance must adapted to the wave guide impedance and must perform the next condition

$$Z_s = Z_0$$

If we respect this condition we can make the all microwave power to be transmited to guide wave and then to the load [6].

If well consider the wave amplitude given by the generator is propagate to the load to the wave guide V_+ and V_- the wave amplitude is reflected from the load to the guide wave generator. The propagated equation solution of the wave is:

$$\frac{\partial^2 V}{\partial x^2} = \gamma V \qquad \text{and} \qquad \frac{\partial^2 I}{\partial x^2} = \gamma I$$

where: I(x,t) and V(x,t) – instant values of the current and the tension at the point „x" on the propagated guide direction [7].

$\gamma = \alpha + j\beta$ – the propagated guide constant and the equation solution is:

$V(x) = V_+ e^{-\gamma x} + V_- e^{-\gamma x}$

$I(x) = I_+ e^{-\gamma x} + I_- e^{-\gamma x}$

$V(x,t) = V_+ e^{-\gamma x} + V_- e^{-\gamma x}$

RESULTS AND DISCUSSION

The experimental results are presented in the next table and figures.

Mat. Temp. [^{0}C]	1 layer of material ε'_1; ε''_1		3 layers of material ε'_2; ε''_2		4 layers of material ε'_3; ε''_3	
	FUS	P_r [%]	FUS	P_r [%]	FUS	P_r [%]
20	5,747	49,5	6,546	54,01	5,916	50,52
40	1,360	2,32	1,732	7,18	1,527	4,35
60	1,950	10,37	1,914	9,84	1,914	9,84
80	3,646	30,47	4,138	37,3	4,344	39,15
100	10,09	67,18	7,071	75,22	7,071	44,79
120	16,49	78,44	8,124	60,96	8,06	60,73

Mat. Temp. [^{0}C]	5 layer of material ε'_4; ε''_4		6 layer of material ε'_5; ε''_5		7 layer of material ε'_6; ε''_6	
	FUS	P_r [%]	FUS	P_r [%]	FUS	P_r [%]
20	1,890	9,48	9,70	66,11	6,72	55,47
40	1,730	7,15	2,30	15,52	1,80	8,16
60	1,732	7,17	1,77	7,72	1,65	6,01
80	3,780	33,82	4,10	36,94	3,41	29,86
100	7,070	56,57	7,48	58,39	7,10	56,71
120	7,940	60,26	12,08	71,75	11,57	70,70

FUS – stationary wave factor
ns – material layers number
Pr – reflected power

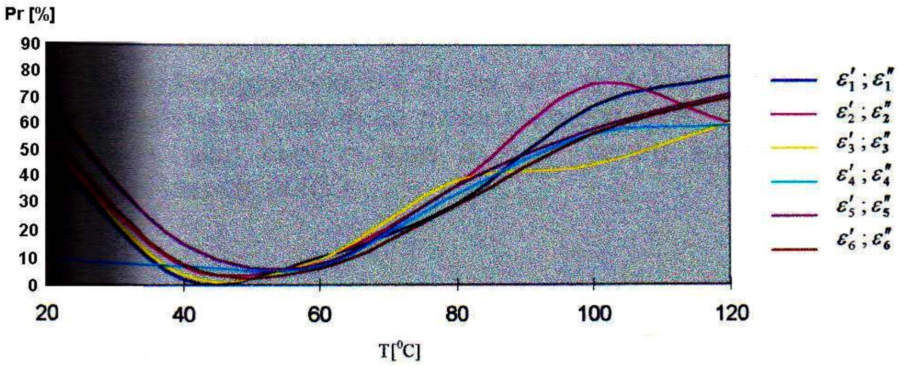

Fig. 2. Reflected power P_r depend of the dielectrical material constant values and the temperature

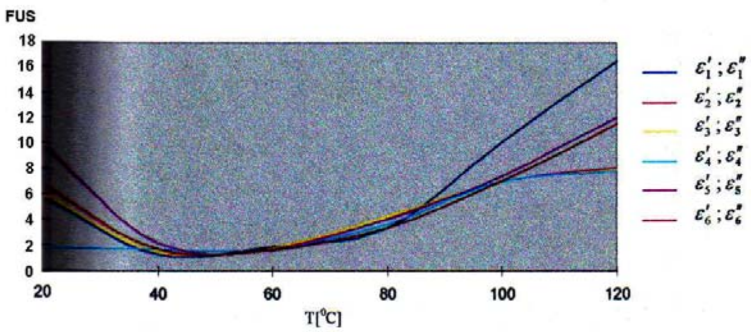

Fig. 3. Stationary wave factor FUS is function of material and temperature

DISCUSSIONS AND CONCLUSIONS

If we analyses the graphics we can se the optimum of material layers for „P_r” < 30% and FUS ≤ 4 in processing temperature of 100 degrees.
Form the effectuated experiment we observed that the loss factor is smaller then 10^{-2} and we must make high electric field intensity for growing the temperature of treated material with microwave.

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