High Temperatures in Microwaves ovens using 3 microwaves energy sources

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***Abstract* – Heating of ceramics need high temperatures, over 1000º C that can be obtained by using several microwaves energy sources in the furnaces. The positioning of the magnetrons in 3 different plans offers the possibility to increase the power and the temperature.**

***Keywords:* Magnetron, microwave, electromagnetic field.**

I. INTRODUCTION

Normaly a microwave Owen has a single magnetron like a microwave energy source. Using more magnetrons and more joints cavity-guide, we can obtain more energy in the microwave Owen and we have a better control of the temperature of the body.

II. CONTENT

The problem is that with more magnetrons we can loose a part of the energy by reflexion inside the cavity. The electromagnetic field will use the other joint cavity-guide to go out and to derange the neighborhood magnetron.

The solution is to find a geometrical positioning of the joint in different rectangular plans and to minimize the reflexion phenomena.

In the Fig. I, Fig. II and Fig. III, we are presenting the positioning of the joint in a microwave Owen with 1, 2 or 3 magnetron sources. It is obvious that each joint is places on a side of the cube that represent the cavity.

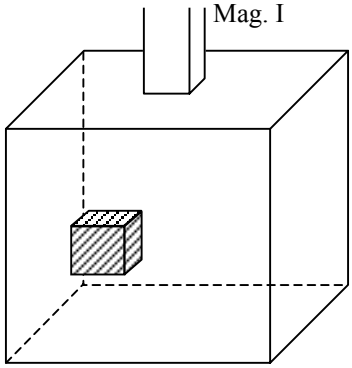


Fig. I. Cavity with 1 magnetron

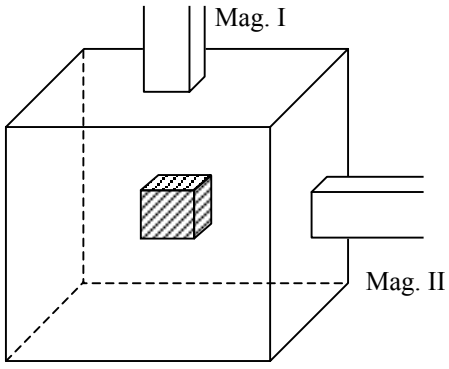


Fig. II. Cavity with 2 magnetrons

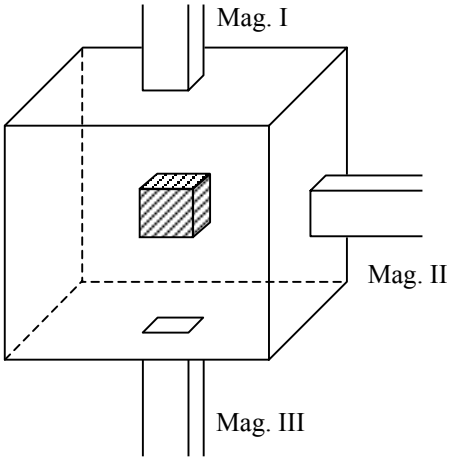
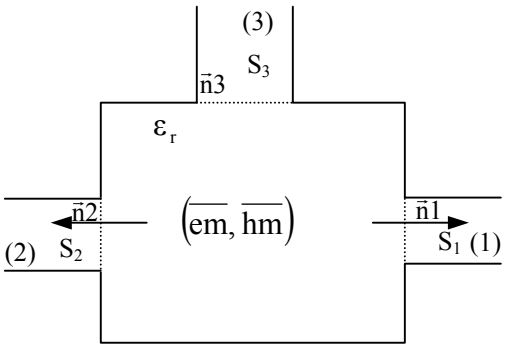


Fig. III. Cavity with 3 magnetrons

The theoretical explanation for the positioning of the joints in different plans is that the electrical and the magnetic field are oscillating in different rectangular plans.



$$\overrightarrow{rot}\,\vec{E} = -j\omega\mu_0\vec{H}$$

$$\overrightarrow{rot}\,\vec{E} = j\omega\varepsilon\vec{E}$$

$\vec{n}\cdot\vec{E} = 0$, electrical wall – Dirichlet conditions

$\vec{n}\cdot\vec{H} = 0$, magnetic wall – Newman conditions

$$\overrightarrow{H^i}(M) = \sum_{l=1}^{\infty}\int_{S_l}\vec{n_l}\cdot\left\{\overrightarrow{rot_l}\,\vec{H}(M_1)\cdot\overline{G_h}(M_l, M)\right\}dS_l$$

The variation T = f(t) for the 3 case presented is shown in the Fig. 4.

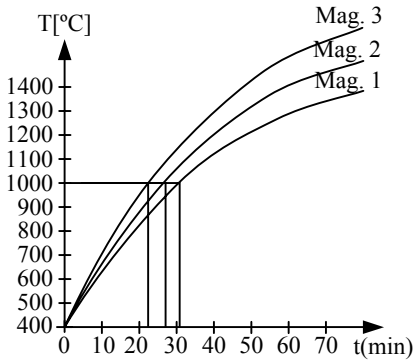
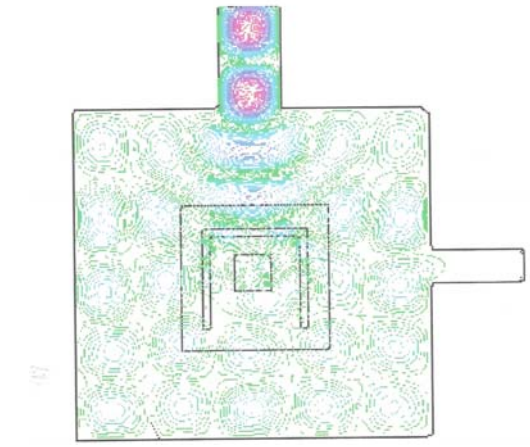
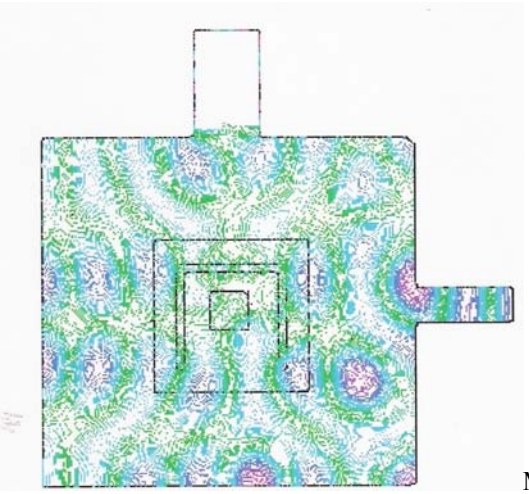


Fig. IV. Variation T = f(t) in the ceramic body

Modeling the electromagnetic field with GFEM in 2D it can be seen the distribution of the electromagnetic field in the microwave oven and in the ceramic body, like in Fig. V.

M1





M2

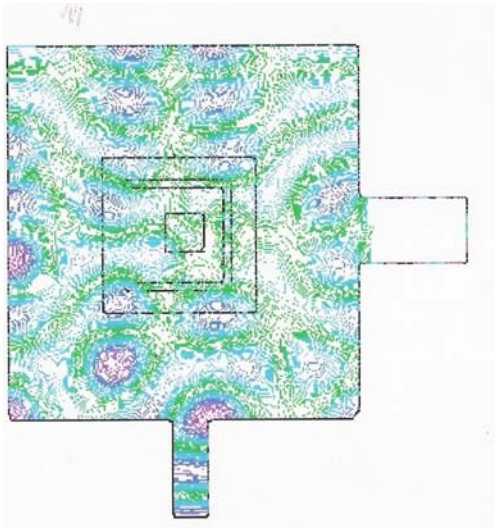


Fig. V. Electromagnetic field distribution in the resonant cavity

III. CONCLUSIONS

Using 2 or more magnetrons for exciting a microwave oven represent a good solution in order to obtain in short time high temperatures.

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