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THE POSSIBILITY OF OBTAINING A AND B PLASTER BY HEATING GYPSUM ORE WITH ENERGY

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Summarry

In this paper we present the basic principles of a new fabrication procedure for β plaster,which is a construction material used to create phonoabsorbant panels,casetated ceilings,regypsums and decogypsums as well as an added material to the fabrication of mortars and polishing plaster coats or orthopedic corsets.

Plaster is an aerial binder obtained by dehydrating gypsum (CaSO4 2 H2O) and forming semyhidrated calcium sulphate (CaSO4 ½ H2O) at temperatures ranging between 85 – 120 degrees Celsius.Obtaining plaster based on a semyhidrate is made under atmospheric pressure (β plaster) and pressures higher than the atmospheric one through autoclavisation (α plaster) or boiling,the first being β construction plaster and the second being α modeling plaster.

The fabrication procedures of the plaster used to the present times are uneconomical and unecological.The proposed fabrication process uses microwave energy and is based on the dielectric propriety of the gypsum.As such,the dehydration of gypsum is made possible through dielectrical heating in a resonant cavity with microwave power.

The termic energy dissipated in the dielectric with losses, CaSO4 2 H2O in the microwave field leads to the dehydration of gypsum at a normal atmospheric pressure,transforming it into β plaster (CaSO4 ½ H2O).The advantage of this procedure consists in accuracy,quality and environmental safety.

1. INTRODUCTION

In this paper we present some theoretical aspects regarding the principle of absorbtion and attenuation of sounds in ambiental surroundings,living chambers,show rooms,restaurants,theatres,etc. by plaquing the interior walls and ceilings with plates,panels and casetated ceilings made out of light construction material that belong to the category of aerial binders like β construction plaster and α modeling plaster.

Using such new polymeric materials as a reinforcement material opens the way to fabricating new composite materials.A polymeric material known fro it’s termo and phonoabsorbant proprieties that is being used in the shape of plates in construction is expanded polystyrene.Expanded perlite is also being used in fabricating lightweight construction materials along with the above mentioned thermoplastic material.At S.C. “Congips” S.A. Oradea,which is a factory of lightweight construction materials,the fabrication of compositions based on α plaster is being tested,with added powders and minced expanded polystyrene grains for the building of casetated panels and ceilings available with diverse decorative models.

Due to the basic material,α plaster made through autoclavisation at S.C. Congips S.A. Oradea,the casetated plates,panels and ceilings satisfy the highest health,sonic comfort fire resistence and durability standards.Being armed with minced expanded polystyrene grains,the plates and ceilings are lighter,do not change their shape and size and have a good level of porosity,attenuating sound and noise very well. Also they can be decorated with paint or hydraulic pulverization to stop exfoliation phenomena with different decorative models.

2. THEORETICAL ASPECTS REGARDING THE PROPRIETIES OF PHONOABSORBANT MATERIALS

The proprieties of materials are directly connected to their structure,crystalline state,density and important characteristics: proportionality limit,leakage limit and resistence to tearing.For normal tensions in the proportionality domain of the specific tension-length line,Hooke's law is applicable:

$$\tau = E \cdot \varepsilon \quad (1)$$

where $\tau = \frac{F}{A_0}$ is tension and

$\varepsilon = \frac{Al}{l_0}$ is the specific length,

while E is the longitudinal elasticity module.

Under the solicitation of traction,a shrinking of the bar diameter takes place: $\Delta = d - d_0$,a transversal contraction resulting from here:

$$\varepsilon = \frac{A}{d_0} \quad (2).$$

Between the longitudinal deformation and the transversal deformation we have the following relation:

$$\varepsilon_t = -\upsilon \cdot \varepsilon \quad (3)$$

where υ is the transversal contraction coefficient of Poisson,the opposite length being Poisson's constant:

$$m = \frac{1}{\upsilon} \quad (4)$$

For tangential tension,Hook's analog relation is:

$$\xi = G \cdot \gamma \, \text{T} \quad (5)$$

where $\frac{d_u}{d_y}$ is the specific slip rate and

G - is the transversal elasticity module.

Between the sizez E,G and υ we have the following relationship:

$$G = \frac{E}{2(1+\nu)} \quad (6)$$

The values E,G and υ of materials indicate the state they are in as well as their proprieties,so that we have:

F_p=f(E, G, ν) (7)

– where Fp is a function of the propriety for composed solicitation,after the theory or hypothesis of Miles that is applicable in the case of materials that can be deformed and break at the beginning of plastic deformations,and that refers to the variation energy of the form at external physical solicitations gives out energy to the acting body.

$$\tau_{ech} = \sqrt{\tau_i^2 + 3(\alpha_0 \cdot \xi_i)^2} \quad (8)$$

– where τ_{ech} is the expression of equivalent tension;

$$\tau_{ech} = \sqrt{3\xi}$$

α0 = correction coefficient resulted from the limit tensions of materials; ζ = tangential tension resistant to shreading; τi = tension or resistance to bending,solicitation that construction materials are not undergoing.

Phonoabsorbant construction materials are more rigid with a higher porosity level and are,in general,compositions that have the mechanic characteristics of reinforcers (E,G,υ) as well as very low density.The attenuation and absorbtion principle of sound waves is through multiple reflexions and refractions of sound in the interior of the material's pores. (Fig 1)

The sound waves that are being issued by a generator and reach the body surface are being absorbed,reflected or transmitted through a porous invironment.

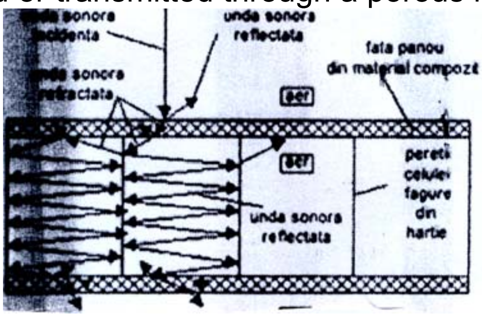

Fig. 1 – The principle of attenuating sound waves through absorbtion,reflexion and refraction.

The incident sound wave is a reflected part,a refracted part and an absorbed part:

$$\theta_i = \theta_{reflect} + \theta_{refract} + \theta_{abs} \quad (9).$$

This relationship,after being devided to the incident sonor flux becomes:

$$\theta = \frac{\theta_{refl}}{\theta_i} + \frac{\theta_{refr}}{\theta_i} + \frac{\theta_a}{\theta_i} \quad (10)$$

Noting with α,β,δ the above mentioned dividing,we obtain:

$$\alpha + \beta + \delta = 1 \quad (11)$$

The phonoabsorbant construction materials that have a high reflexion or refraction sound absorbtion capacity are characterized by the phonic absorbtion factor α,phonic refraction factor and phonic reflexion factor Δ.

Raported to the power of an incident soundwave noted with W,we can conclude that the most wanted phonoabsorbant materials are those with the following report: $\frac{\alpha}{w}$

This desire,corroborated with the characteristics of the materials (G, E, ν) as well as the theory of the variation of energy by Miles,opens the path to fabricating construction materials with very good phonoabsorbant proprieties that have a higher phonoabsorbant coefficient.

3. PRACTICAL ASPECTS

In the construction of phonoabsorbant panels and casetated ceilings used in ambiental surroundings and rooms for the plaquing of walls and ceilings,composite materials based on modeling plaster α are used,reinforced with glass fibres,cellulose fibres and plated with cardboard bits,known under the name of regyps,decogyps,etc.One of the characteristics of the parts created with α plaster (CaSO4 ½ H2O) is that,through hydration,as shown in the relationship:

$CaSO_4 \cdot ½ H_2O + 3/2H_2O = CaSO_4 \cdot 2H_2O$

we can obtain hydrated calcium sulphate.

During the engagement of the plaster,the CaSO4 crystals grow and bind themselves together creating pores.On the size of these pores depends the phonoabsorbant character of the modeling plaster α plates.Porosity and G,E and ν characteristics of the plaster can be improved by adding very light and porous polymeric materials to the composition,that create a very good mechanical engagement with α plaster.

At S.C. Congips S.A. Oradea,research and tries to obtain new composite materials based on the α plaster matrix are being made.This material has a low density,very low E,G,υ rates,very good plasticity and the propriety to absorb sounds,allowing the variation of internal energy through the shape of the material.

The characteristics of the newly obtained material will be presented after the brevetation of the product.

4. CONCLUSIONS

1. Among new materials with phonoabsorbant and termoisolation proprieties we can also integrate the compositions of materials based on α plaster,armed with plastic material (polymeric grains).

2. By arming α plaster with minced expanded polystyrene grains,the casetated ceilings,plates and panels do not modify their shape and size.

3. From the newly obtained material made at S.C. Congips S.A. Oradea,a new variety of ceilings can be constructed using a multitude of available decorative models.

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