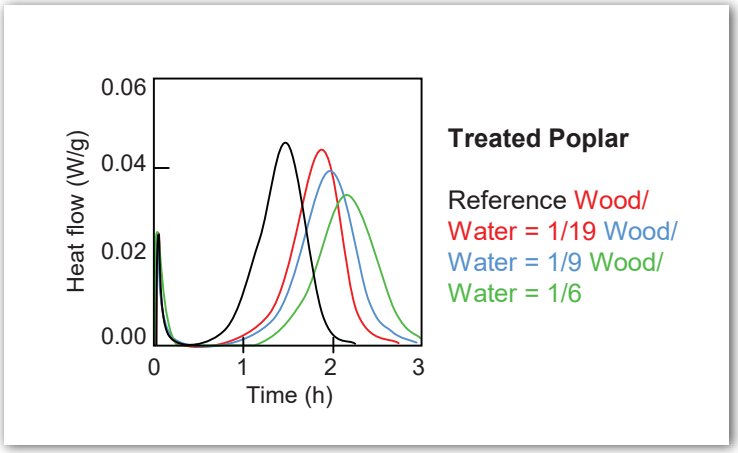
The influence of wood aqueous extractives on the hydration kinetics of plaster

INTRODUCTION

For several decades, many investigations have been realized on the reinforcement of mineral binders (cement, concrete or plaster) in particular on the replacement of usual mineral reinforcing agents (glass or asbestos fibres) by organic agents such as sisal, Kraft pulp, or cellulose fibres.



The influence of the poplar/water ratio on the hydration kinetics of plaster

Advantages of composites plaster/wood :

- this product is healthier than cement reinforced by asbestos fibers.
- it is less expensive.
- it is lighter
- it makes it possible to use cellulose materials of rejects (chips…) in order to develop them
- it is frequently used as acoustic baffle on the edges of motorways.

EXPERIMENT

Wood extracts were prepared with various water / wood ratios in order to observe the influence of concentration. After grinding, wood (ten grams) has been dipped in ultrapure water during 1h under magnetic stirring, the mixture was filtered on a Büchner funnel and refrigerated until the experiments took place.
A CALVET was used calorimeter with an electrical accessory to stir the mixture between plaster and wood extracts. The mixture (aqueous extracts / plaster ratio 1:1) was stirred for 2 min after putting them in contact. The experiment was performed at 25°C.

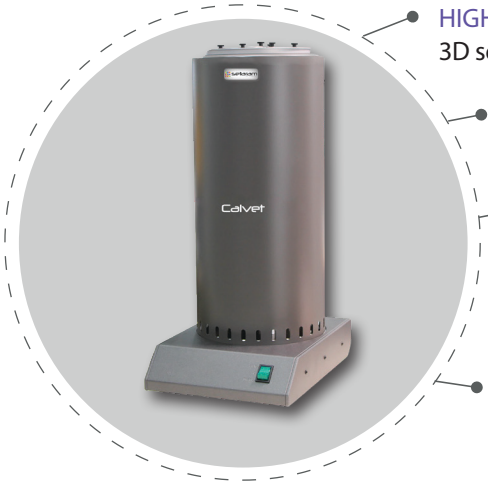
RESULTS AND CONCLUSION

Two exothermic phenomena were observed.
The first corresponds to the dissolution of plaster in the liquid immediately after contact and stirring. Then, the curve returns to baseline: during a certain time no reaction is observed.
Gypsum nucleation is suspected to take place at this stage of reaction.
The second exothermic phenomenon represents the hydration reaction itself: the increase of heat flow shows, at the same time, gypsum crystal growth and plaster dissolution.
After the total depletion of plaster, the heat flow decreases, only further crystal growth occurs during the last part of the curve.
Therefore, the results show clearly that wood has a delaying effect on the hydration of hemihydrate.
We can also note that the peak time, which corresponds to the total depletion of plaster, increases with the wood/water ratio: the concentration of extracts influences the time of hydration.

INSTRUMENT

CALVET

Ambient to 300°C



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For more details ask for publication B1721

Reference: The influence of wood aqueous extractives on the hydration kinetics of plaster. P. Boustingorry, P. Grosseau, R. Guyonnet, B. Guilhot. Cement and Concrete Research 35 (2005) 2081 – 2086