

## INFLUENCE OF PROCESSING OF MIXTURES AND ADJUSTMENT OF FLY-ASH ON CHARACTERISTICS OF POPBETON

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*Since 2003, when was coupled narrow cooperation among Department of Glass and Ceramics, ICT Prague and Department of Construction Technology, Czech Technical University in Prague, proceeds research of alkali activated fly-ashes from big coal plans in the Czech Republic.*

*On the basis geopolymerical reaction is fly-ash exploited like binder for real concrete mixtures. Aim hereof research is application gained results research to the practical use in building practice. In concrete mixtures alkali activated fly-ash substitutes conventional cement binder. By one of problems that the dramatically make more difficult usage of alkali activated fly-ash like binder is necessity of adding of energy as a warm or heating, that is necessary to itself activation. Possibility activation of fly-ash without necessity of tempering was already processed, however time necessary for hardening these mixture is for real usage too long.*

*In this paper are submitted some results, that were achieved at POPbeton production without necessity of tempering. Adjustment of*

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*production processes was find optimal process for POPbeton production. By the help of some admixture was achieved how fit workability, so expressive shortening of time of POPbeton hardening. Next improvement resulting how physical mechanical, so production feature was achieved thanks previous adjustment of fly-ash.*

## **1. Introduction**

Alkali activated fly-ash showed like fit binder for use in concrete mixtures. Compared to classical cement concrete however embodies some dissimilarities and deficiencies. The biggest problem for usage of POPbeton is long time at start compressive strength. Was then necessary speed up course alkaline activation in laboratory conditions. (20°C). Like fit way showed some admixtures, previous adjustment of fly-ash and optimum production processes of concrete mixtures so, to was quantity of water in mixtures what smallest and no depress concentration of alkali activators and at the same time to in mixtures was sufficient water quantity so it was in due form workable.

## **2. Production processes**

For achievement optimum results was necessary optimize suitable progress of samples preparation. From former piece of knowledge were evident two possible processes. First possibility is activating fly-ash with NaOH (in solid or liquid state) and sodium-silica glass in liquid state. To the activated fly-ash is filler like dried aggregate added and subsequently is water on adjustment consistence added.

Alternate is turning this technological process. First moisten aggregate on min. 1,5% moisture of weight, after it dry NaOH, fly-ash and sodium-silica glass in liquid state and eventually next water on consistence is added.

## **3. Admixtures**

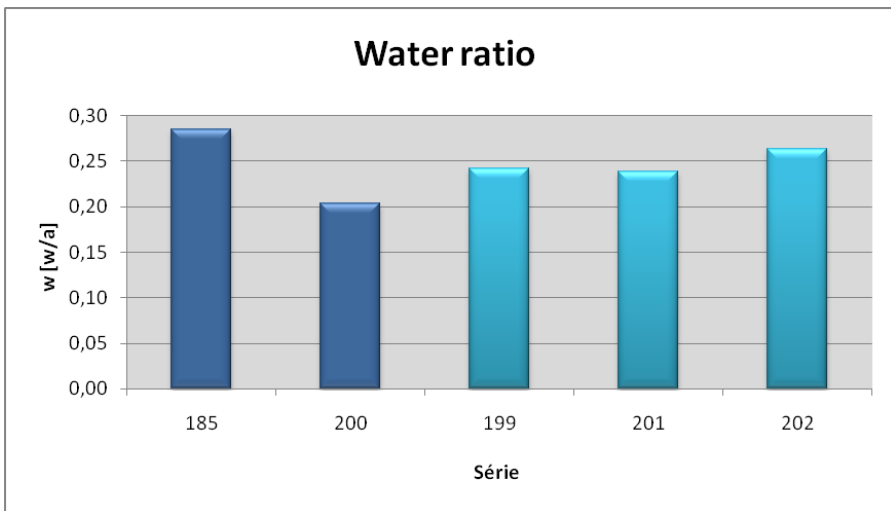
As one of possibility of speeding whole activation reaction, addition of some admixtures is. As suitable admixtures shows especially admixtures with higher content of CaO, as are e.g. blast-furnace slag, variety of clay and earths, fly-ash from fluid combustion, lime or cement. Experimental cubes size 100/100/100 mm where prepared. Blast-furnace slag and lime hydrate in different quantity as admixtures were used. They were prepared

to alternate technological process. Quantity of admixtures on quantity of fly-ash features tab. 1.

**Tab.1 – quantity of admixtures with CaO**

	<b>185</b>	<b>200</b>	<b>199</b>	<b>201</b>	<b>202</b>
ground slag	0%	10%	10%	10%	10%
lime CL 90-G	0%	0%	2%	5%	8%

Quantity of lime hydrate -  $\text{Ca(OH)}_2$  - was possible escalate to 8% from quantity of fly-ash. No expressive changes or problems at processing of mixtures were showed. Quantity of water in mixtures is in pict.1 showed.



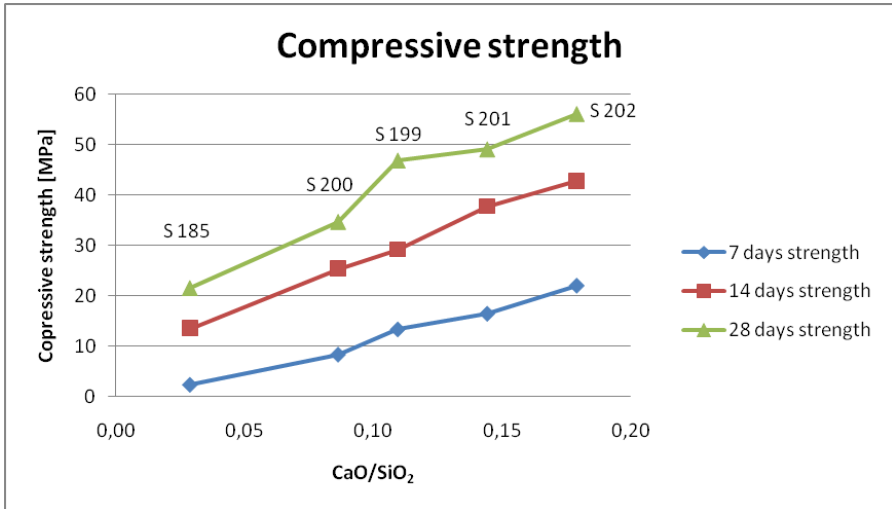
**Pict.1 – water ratio for series with lime hydrate and slag**

Using of ground blast-furnace slag and lime hydrate showed like acceptable combination for achievement of optimum compress strength characteristics. Slack lime (calcium hydroxide) does not require significant requirements on quantity of batch water and at the same time makes it possible to good workability until quantity 8% of  $\text{Ca(OH)}_2$  on quantity of fly-ash.

## 5. Conclusion

On the basis of achieved results it is possible state, that the characteristics of POPbeton like real mixture, where alkali activated fly-ash as binder is used, it is possible easily modulate how suitable technological processes at mixtures preparation, so adjustment feature of fly-ash, like

milling of fly-ash. To achieve required features it is possible also with advantage usage of some admixtures.



**Pict.2 – compressive strength for series with lime hydrate and slag**

Technologically less exacting is preparation with admixture of burnt lime (CaO), but its using is however dull on less quantity, because of workability mixtures. Admixture of lime hydrate (Ca(OH)<sub>2</sub>) shows like better solution also by higher quantity usage. But it requires advance preparation of lime hydrate that makes difficult for usage those mixtures in industrial production.

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