



11th International Conference Interdisciplinarity in Engineering, INTER-ENG 2017, 5-6 October 2017, Tîrgu-Mures, Romania

## Study on the optimization of some cement based mixing binders' characteristics

Mircea Rujanu<sup>a</sup>, Livia Ingrid Diaconu<sup>a,\*</sup>, Dănuț Babor<sup>a</sup>, Diana Plian<sup>a</sup>, Adrian Constantin Diaconu<sup>b</sup>

<sup>a</sup>Technical University "Gheorghe Asachi" from Iassy, Faculty of Civil Engineering and Building Services  
<sup>b</sup>Romanian Association of Earthquake Engineering

---

### Abstract

The mixing binders based on construction cement have a reduced impact on the environment and allow the recycling of some artificial byproducts resulted from burning in the energetic industry, coals burning or natural such as volcanic tuffs with great resources in Romania. The paper presents the results of the research from the Building materials discipline from Faculty of Civil Engineering and Building Services from Iassy, Romania on the using of the industrial byproducts in construction field. The characteristics of the cement - thermal power plant ash mixtures in the fresh state and, as well for the final hardened state, were analyzed.

© 2018 The Authors. Published by Elsevier B.V.

Peer-review under responsibility of the scientific committee of the 11th International Conference Interdisciplinarity in Engineering.

*Keywords:* mixed binder; mortar; microconcrete; cement; fly ash.

---

### 1. Introduction

The actual Norms regarding the great energy consumption and great noxes releasing in the atmosphere manufacturing processes, phenomena that are specific for cement industry, make necessary, in a significant way,

---

\* Corresponding author. Tel.: +40-723-706-898.

E-mail address: [liviagroll@yahoo.com](mailto:liviagroll@yahoo.com)

to introduce consumption methods based on significant reducing of the clinker amount [1,2]. The solution of the clinker amount's reducing and its replacing with different admixtures types, such as slag and thermal power plant ash, but in proportion of 80-85%, even is not very new, is less used and is referring to the mixed binders based on cement.

The advantage of the mixed binder's based on cement using is answering to the exigencies referring to the energy consumption and noxes releasing from the manufacturing process and, in the same time, is favoring the introduction in the binder's composition of some residual products [2,3]. The introduction of some residual materials (such as are presented above) represents a society desire, because is resolving the toxic residual products depositing issue, that has a great complexity and which resolving solution supposes important financial efforts [4].

The theory regarding the utilization of the mixed binders and great slag or ash admixture proportions is showing that the using of these binders is limited to the realization of some low strength simple or reinforced concrete elements, more or less function of the admixture and the admixture's type, but presenting structural sustainability characteristics corresponding to some usual concretes [5].

So, it have to be mentioned that:

- The strengths of the obtained binder have low values.
- The structural and sustainability characteristics are corresponding to the composites with usual cements.

From the practical activity point of view, in the conditions when the implementation in production of these is wished, certainly the mechanical strengths level has to be increase (unless the compression strength) and, in the same time, the compactness improvement by additives utilization and by the completing of the granularity curve with fine part is necessary.

## 2. Research program

In this research, taking into account that different solutions regarding the binders' improvements are analyzed, the following are proposed:

- The matrix where the binder will be introduced to be almost similar with the polygranular quartzeous sand from the plastic mortars, so an aggregate having the maxim dimension of 4 mm (not 2 as in plastic mortar's case) will be used. The amounts of the sorts are:
  - 0,00 – 0,50 mm – 150g
  - 0,50 – 1,00 mm – 300g
  - 1,00 – 2,00 mm – 450g
  - 2,00 – 4,00 mm – 450g
- The cement dosage – 450g
- W/C ratio – 0,50

A cement – ash type mixed binder is used having the following proportions:

- Unitary cement of type CEM I / 42,5 N – 15% or 20%
- Thermal power plant ash collected by wet process – 85% or 80%

The thermal power plant ash represents a hydraulic admixture, so it will manifest a hydraulic character only in the presence of the activator, which in this case is represented by the calcium ion from the cement and by reaction with it will form reaction products presenting a hydraulic character.

The reduced mechanical strengths and the great porosity are representing the reasons that in this study, in certain proportions, the ultrafine silica (UFS) was introduced in the mixture, which, as studied and known reactive powder [5,6], can contribute to the mechanical strengths increasing and, in the same time to have a favorable effect regarding the improvement of the mixture's compactness.

Download English Version:

<https://daneshyari.com/en/article/7544837>

Download Persian Version:

<https://daneshyari.com/article/7544837>

[Daneshyari.com](https://daneshyari.com)