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POSSIBILITY OF USING RECYCLED RAW MATERIALS (CORUNDUM AND SILICON CARBIDE) IN CEMENTITIOUS MIXTURES

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ABSTRACT

The main aim of this paper is possibility of using recycled raw materials in form of new cementitious recipes. Paper is focused on relationship between compounds in matrix, making knowledge about structure and function on microscopic level and create limit its technical properties. Artificial corundum and silicon carbide are increasing especially mechanical parameters of mixture because these materials have number 9 on Mohs hardness scale. Set of measurements about primary characteristics of this materials were done as well as the basic physical, mechanical and material properties of cement mixtures.

Keywords: corundum, silicon carbide, recycling, cement, concrete, nanoparticles.

INTRODUCTION

Development of combination cement-silicon production is relatively new discipline and questions about this innovation are very popular in these days. Purpose of this research is using waste material and therefore minimalizes of its production and reduces ecological effect on environment by its recycling. Especially it is about waste production of corundum and silicon carbide. Between sources of these recycle materials belong for examples suction from drilling on filters, material catch by magnetic separation, non perfect corundum and SiC produce, sludge from cleaning raw materials, blasting by dry and wet method or damages abrasive grains. This waste material should be reused as basic component to concrete samples.

Silicon Carbide is produced in resistance furnace, where exact mixtures of petroleumcoke and siliceous sand are burnt Silicon Carbide arise by increasing of crystals in the core of furnace during smelting. After cooled, furnace is disassambled, material is sorted and according to the quality is classified to material suitable for a production of abrasive grains and material suitable for metallurgy. Artificial corundum is divided into two kinds. White Corundum is produced by fusing of clean Al_2O_3 in electrical arc furnace. After crushed it and milled it on ball mills, arised corundum grains are several times magnetized and sieved according to the sizes. A block of Brown Corundum is smelted from calcinated bauxites, cokes and Fe cuts in arc electrical furnace. From that block, lump of I. grade is sorted out, milled on roll crusher, magnetized, annealed at temperature of 1050°C and sieved according to a required granulometric composition.

In this paper waste of corundum and silicon carbide in form of cement mixture is analyzed. Especially mechanical parameters of mixture and chemical, physical and material

characteristics of raw materials are analyzed. New recipes should be able to show superior properties compared to the reference formulation (the current production on the market), while also lower the energy consumption and environmental load on the production of mixture per unit amount. The project will create a new product and its subsequent production.

RESULTS AND CONCLUSIONS

In this paper, three kinds of raw materials have been used in cementitious materials: white corundum (denote as WC), brown corundum (denote as BC) and silicon carbide (denote as SC). Each of samples belongs to the different group according to quality. Set with the highest quality is marked A and with the lower C. Fourth group is marked W, which mean waste material. In total it was measured characteristic of seven samples of raw materials.

Table 1 - Chemical composition of recycled raw materials
(S-suction, D-dust, BE - burning electrode, F-fine, B-basic)

Base	**SC**				**WC**		**BC**
Origin	**D**	**BE**	**0-1B**	**0-1F**	**S**	**D**	**D**
Quality	**W**	**W**	**B**	**C**	**B**	**B**	**B**
Al	1,39	4,71	0,23	0,3	91,47	97,94	67,4
Si	95,55	48,71	96,24	95,69	0,18	0,15	13,01
Fe	0,49	22,78	0,79	0,99	1,35	0,39	5,92
Ca	0,11	6,74	0,4	0,56	0,35	0,18	3,13
S	-	8,59	1,41	1,46	-	-	0,62

Nano structural properties of SiC and corundum in cementitious matrix show a huge influence on basic mechanical and physical properties of cement samples.

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