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PROPERTIES OF COMPOSITE BINDERS FOR FINE-GRAIN CONCRETE

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ABSTRACT

Our research is devoted to the use of waste from the energy industry (fly ash from thermal power plants), the copper smelting industry (copper smelting slag) in the preparation of composite binders used for fine-grained concrete[1].

It has been established that fly ash can be used without processing as an additive when grinding cement clinker (up to 20-30% of the cement mass) without changing the properties of the cement clinker; plasticizing additive in light and heavy concrete, mortars (up to 60% of the cement mass); raw materials for the construction and strengthening of road foundations (up to 20% of the mass of cement and sand); additives in the production of clay bricks (up to 45% of brick volume); instead of sand in the production of lightweight concrete products (15-25% of the volume of aggregates); component for the production of local binders (up to 80% of the binder mass) grades 75-400; raw materials for mineral fertilizers and neutralization of acidic soils in agriculture [2].

To carry out research work, the following materials were used as components of fine-grained concrete: Portland cement class SEM I 32.5N from the Sherabad cement plant; copper smelting waste; fly ash from Novoangrensky thermal power plant [3].

Two compositions were prepared: in one, part of the cement was replaced with slag from copper smelting, in the other, fly ash. The specific surface area of the slag was respectively 2800 g/cm² and the specific surface area of the fly ash was respectively 4500 g/cm².

Waste was added to the cement in amounts of 5, 10, 15, 20 and 25% by weight of the binder and cube samples measuring 3x3x3 cm were molded from this mixture. The samples were subjected to heat and moisture treatment and hardening for 28 days in a humid environment. The compositions of the mixtures are given in Table-1 and 2 [4].

Compositions of composite binders for fine-grained concrete using copper smelting slag Table 1

Name of compositions	Mixture composition			В/Ц	НГЦТ, (мм)
	Portland cement grade 400 (G)	Copper smelting slag (%)	Water, (L)		
1	300	-	81	0,270	6,0
2	285	5(15)	87	0,290	7,0
3	270	10(30)	85	0,280	6,5
4	255	15(45)	82	0,273	6,0
5	240	20(60)	81	0,270	5,0
6	225	25(75)	80	0,266	6,0

Compositions of composite binders for fine-grained concrete using fly ash Таблица 2

Name of compositions	Mixture composition			V/C	NGCT, (mm)
	Portland cement grade 400 (G)	Ash fly (%)	Water (L)		
1	300	-	81	0,270	6,0
2	285	5(15)	90	0,300	7,0
3	270	10(30)	95	0,317	6,0
4	255	15(45)	102	0,340	7,0
5	240	20(60)	105	0,350	5,0
6	225	25(75)	112	0,373	6,0

Analysis of the results of tables 1 and 2 shows that the water requirement of the mixtures corresponds to normal density and has changed significantly compared to the mixture without fillers.

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