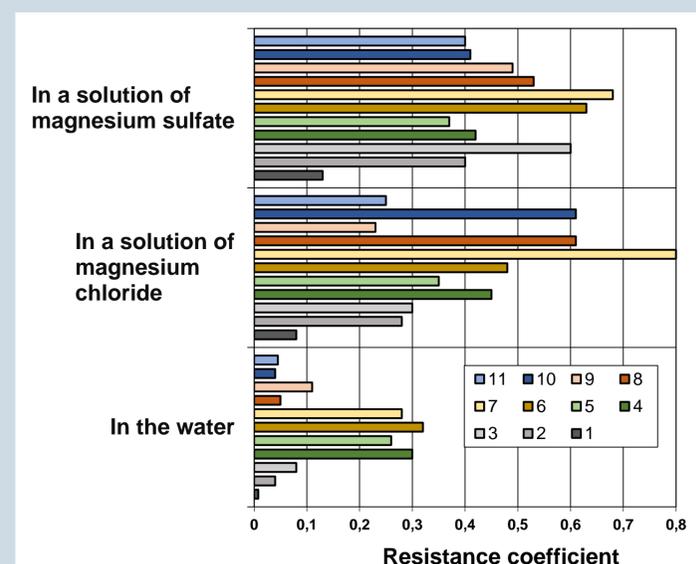


Increasing the operational durability of magnesite products is aimed at resource conservation at all stages of the life cycle of construction projects and at creating an ecologically safe living environment.

- 1 – caustic magnesite + solution $MgCl_2$ with a density of 1250 kg/m^3 ;
- 2 – caustic magnesite + solution $MgCl_2$ with a density of 1200 kg/m^3 ;
- 3 – caustic magnesite + solution $MgCl_2$ with a density of 1150 kg/m^3 ;
- 4 – caustic magnesite + solution $MgSO_4$ with a density of 1200 kg/m^3 ;
- 5 – caustic magnesite + solution ($MgCl_2 + MgSO_4$);
- 6 – caustic magnesite + solution $FeSO_4$ with a density of 1200 kg/m^3 ;
- 7 – caustic magnesite + solution ($MgCl_2 + FeSO_4$);
- 8 – caustic magnesite + metallurgical slag (50%) + solution $MgCl_2$;

- 9 – caustic magnesite + metallurgical slag (50%) + solution ($MgCl_2 + MgSO_4$);
- 10 – caustic magnesite + iron ore processing waste (50%) + solution $MgCl_2$;
- 11 – caustic magnesite + iron ore processing waste (50%) + solution ($MgCl_2 + FeSO_4$).



Resistance coefficient of magnesite binders of various compositions in the aggressive liquids.

Introduction

The main problems of using cements in the concrete: they are high material intensity and energy consumption of cement production, large CO_2 emissions during firing of cement clinker, long-term heat and moisture treatment for accelerated hardening of products. Predominance of weakly crystallized hydrates in cement stone often creates difficulties for the technology of porous concretes, increases the risk of destructive processes during operation of objects.

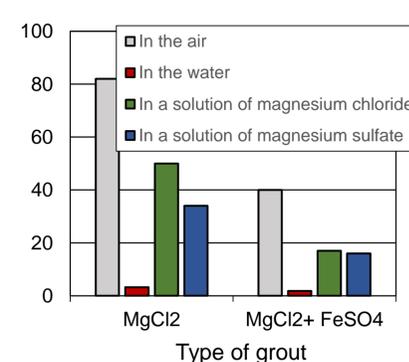
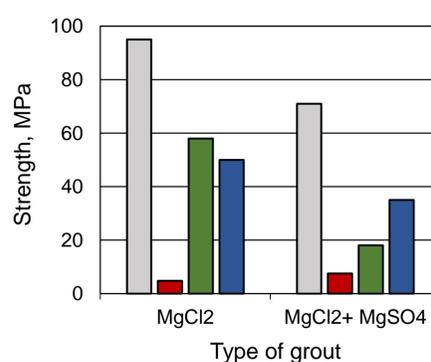
It is important to develop energy-efficient technologies of low-carbon concretes based on magnesia binders.

The purpose of the research is to study the effect of mineral additives and salt sealers on the hardening and resistance of magnesia binders in aggressive liquid environments.

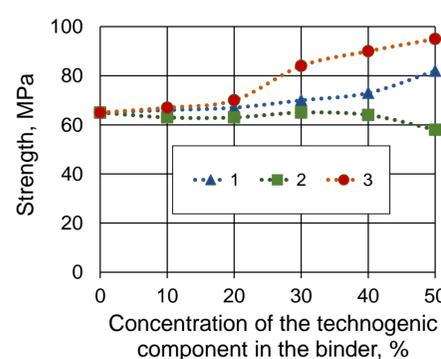
Research methods

The object of the study was caustic magnesite and composite magnesia binders based on it. To obtain composite binders technogenic materials of various compositions and origins were added to the caustic magnesite, they are metallurgical slag, ash from thermal power plants, and waste from iron ore enrichment. Solutions of magnesium chloride, magnesium sulfate, and iron sulfate of various densities were used to mix the magnesia binders. Conditions for testing the operational durability of binders: the samples were immersed into the aggressive liquid media after 7 days of hardening in air (water, magnesium chloride solution with a density of 1100 kg/m^3 , magnesium sulfate solution with a density of 1100 kg/m^3).

Results

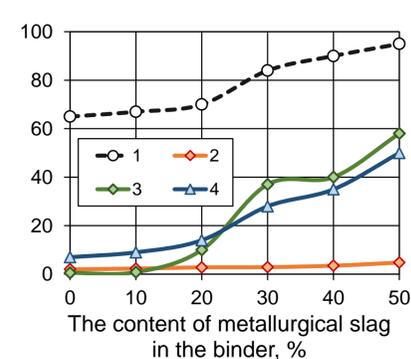


Effect of the grouting fluid composition on the strength of a binder containing 50 % of metallurgical slag (1) or 50 % of iron ore processing waste (2) under various conditions (age 28 days; exposure to liquids 21 days).



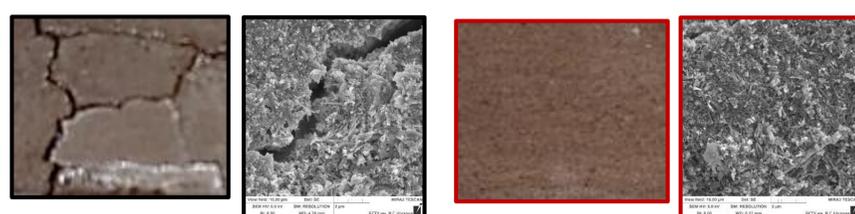
- 1 – iron ore processing waste;
- 2 – thermal power plant ash;
- 3 – metallurgical slag.

Influence of the technogenic component content on the strength of binder at the age of 28 days under air hardening.



- 1 – in the air; 2 – in the water;
- 3 – in a solution of magnesium chloride;
- 4 – in a solution of magnesium sulfate.

Effect of metallurgical slag content on the strength of composite binder under different conditions (age 28 days; exposure to liquids 21 days).



Caustic magnesite + solution $MgCl_2$, Magnesia slag binder + solution $MgCl_2$,
Appearance of samples after exposure to aggressive liquids (1 and 3) and microstructure of magnesium binder stone (2 and 4).