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Analysis of the Properties of Hydrophobised Heat-Insulating Mortar with Perlite

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Abstract : The studies are devoted to assessing the effectiveness of hydrophobic and air entraining admixtures based on organ silicon compounds. Mortars with lightweight aggregate–perlite were the subjects of the investigation. The following laboratory tests were performed: density, open porosity, total porosity, absorptivity, capability to diffuse water vapour, compressive strength, flexural strength, frost resistance, sodium sulphate corrosion resistance and the thermal conductivity coefficient. The composition of the two mixtures of mortars was prepared: mortars without a hydrophobic admixture and mortars with cementitious waterproofing material. Surface hydrophobisation was produced on the mortars without a hydrophobic admixture using a methyl silicone resin, a water-based emulsion of methyl silicone resin in potassium hydroxide and alkyl-alkoxy-silane in organic solvents. The results of the effectiveness of hydrophobisation of mortars are the following: The highest absorption after 14 days of testing was shown by mortar without an agent (57.5%), while the lowest absorption was demonstrated by the mortar with methyl silicone resin (52.7%). After 14 days in water the hydrophobisation treatment of the samples proved to be ineffective. The hydrophobised mortars are characterized by an insignificant mass change due to freezing and thawing processes in the case of the methyl silicone resin – 1%, samples without hydrophobisation –5%. This agent efficiently protected the mortars against frost corrosion. The standard samples showed very good resistance to the pressure of sodium sulphate crystallization. Organosilicon compounds have a negative influence on the chemical resistance (weight loss about 7%). The mass loss of non-hydrophobic mortar was 2 times lower than mortar with the hydrophobic admixture. Hydrophobic and aeration admixtures significantly affect the thermal conductivity and the difference is mainly due to the difference in porosity of the compared materials. Hydrophobisation of the mortar mass slightly decreased the porosity of the mortar, and thus in an increase of 20% of its compressive strength. The admixture adversely affected the ability of the hydrophobic mortar – it achieved the opposite effect. As a result of hydrophobising the mass, the mortar samples decreased in density and had improved wettability. Poor protection of the mortar surface is probably due to the short time of saturating the sample in the preparation. The mortars were characterized by high porosity (65%) and water absorption (57.5%), so in order to achieve better efficiency, extending the time of hydrophobisation would be advisable. The highest efficiency was obtained for the surface hydrophobised with the methyl silicone resin.

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