REACTION OF MOISTURE OF THE AMBIENT MEDIUM WITH HEAT-INSULATING INSERTS FOR FEEDER HEADS AND INGOT MOLDS

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Extensive use is made of hydrophobic coatings and binders to protect heat-insulating inserts against attack by moisture during storage, transport, and shifts. To bestow hydrophobic properties on heat-insulating inserts, they were impregnated with different binders during investigations, the results of which are given in this article (see Table 1).

The inserts were made from slip with a moisture content of 75%, containing (recalculated to the dry residue) 91% of quartz sand with a mean grain size of 0.12 mm, 4% of M5-50 asbestos, 3% of waste-paper, and

TABLE 1. Properties of Inserts Made with Different Hydrophobic Binders

Insert No.	Binder	Mass fraction of binder, %	Insert molding duration, min-sec	Indices of inserts*						
				W, %	calcin. losses, %	P_{ope}, %	ρ_{app}, g/cm³	K, μm²	σ_{flex}, MPa	λ, W/m·°K
1	Indene-coumarone resin	2	2—12	41,14	6,33	55,8	1,09	0,33	0,79	0,25; 0,21; 0,22; 0,215
2		4	2—04	33,78	7,81	55,4	1,10	0,31	1,14	0,36; 0,23; 0,27; 0,25
3		6	1—59	33,58	9,38	57,1	1,07	0,41	1,43	0,16; 0,17; 0,185; 0,208
4	Latex	0,1	2—31	34,66	5,08	56,1	1,09	0,29	0,58	0,26; 0,21; 0,25; 0,23
5		0,2	2—56	33,96	5,90	59,3	1,10	0,44	0,56	0,23; 0,22; 0,20; 0,21
6	Solution of silicic acid sol	0,5	15—25	33,68	4,39	56,5	1,09	0,26	0,28	0,25; 0,24; 0,23; 0,22
7		0,2	7—59	39,0	5,50	Not determined			0,41	0,19; 0,20; 0,21; 0,22
8	UKS resin	1	2—49	28,28	6,39	61,0	1,01	0,40	0,96	0,23; 0,225; 0,23; 0,23
9	KS-11 resin	1	2—57	32,11	5,63	59,2	1,06	0,38	0,32	0,22; 0,23; 0,19; 0,20
10	Solution of sulfite—alcoholic waste	2	26—01	32,76	6,57	55,2	1,08	0,43	1,24	0,16; Not det.; 0,19; 0,22
	The same with added:									
11	latex	0,2	8—01	42,17	8,86	54,7	1,07	0,17	Not determined	
12	polyacrylamide	0,005	6—10	34,30	9,10	61,2	0,97	0,40	»	»
13	KS-11	1	2—29	35,38	6,95	53,8	1,15	0,14	»	»
14	Without binder	—	0—43	33,02	8,10	54,6	1,15	1,48	Not determined	

*W, moisture content after molding; P_{ope}, open porosity; ρ_{app}, apparent density; K, coefficient of gas permeability; σ_{flex}, flexural strength; λ, thermal conductivity (given for an average temperature of 400, 600, 800, and 1200°C).

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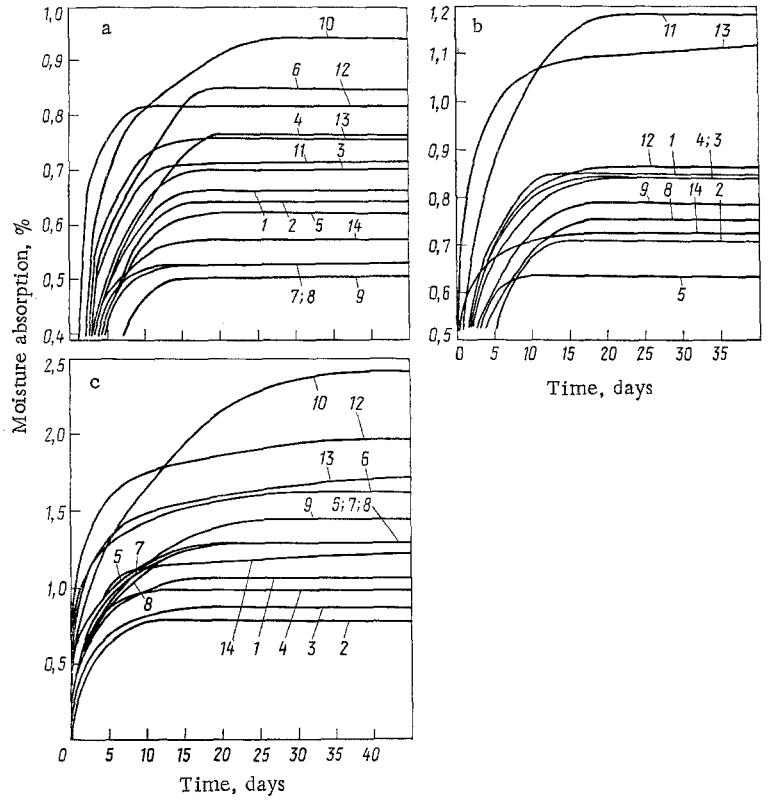

Fig. 1. Moisture absorption of heat-insulating inserts at a relative atmospheric humidity of 70% (a), 80% (b), and 90% (c): 1-14) inserts Nos. 1-14, respectively (see Table 1).

2% of binder; the water was removed from the slip by compressed air (0.5 MPa). We found that the most usable binder for impregnating the inserts was indene—coumarone resin, because it can be introduced into the slip paste as a powder; as it softens during heating, it binds the grains of the filler [1-4]. After molding, the inserts were dried to constant weight and placed in weighing bottles in desiccators, in which a given relative humidity was created. An analysis of information provided by the Meterological Service of the USSR showed that the moisture content of the ambient medium varied over the different regions mainly in the range 70-90%. These values were used in the investigations.

The results of the investigations are given in Table 1; Fig. 1 plots the moisture absorption of the inserts vs their initial composition, the relative atmospheric humidity, and the residence time in the desiccator.

At a relative atmospheric humidity of 70-90%, absorption of moisture by the inserts from the ambient medium takes place intensely for 10-12 days, after which it is stabilized. The maximal moisture absorption depends on the relative humidity of the ambient medium and the type of binder used. Relatively low moisture absorption is displayed by inserts to which indene—coumarone resin is added. Furthermore, such inserts are molded more rapidly than those with other binders, and their flexural strength is higher (Table 1).

Thus, to make the inserts it is best to use indene—coumarone resin, permitting a reduction in their moisture absorption and molding time and an increase in strength.

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