Calcium silicate, siliceous meal

water content determination

Siliceous materials, such as calcium silicate and siliceous meal, are basic materials used to produce refractory goods. They are applied in the petrochemical industry as an insulator, and also in the glass-making industry to produce frictional materials and ceramic whiteware. The structure of insulating refractory materials is usually capillary, which allows water absorption without durability loss. High thermal stability of these products is a result of the manufacturing technology and quality of components used in this process. The amount of water in the calcium silicate should be inspected because the surplus of water may be destructive and affect technical parameters of products. The water content can be checked on the basis of various methods, yet it is advisable to choose the quick and precise moisture analyzer by Radwag.



The application note includes basic information for validation of the calcium silicate and siliceous meal drying method with the use of MA R, MA X2, MA X7 and MA 5Y moisture analyzers series by Radwag Wagi Elektroniczne. The application note may be the basis for elaborating own drying method with special regard to distinctive features of the product in question.

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TERMS

ACCURACY of determining water / dry matter content is the difference between the result of the water / dry matter content received in the moisture analyzer method and the result of the water / dry matter content received while drying the same sample through a reference method.

PRECISION is a degree of compliance between independent results of the test, received in specific conditions. The measure of precision is a standard deviation from a series of several measurements.

REFERENCE METHOD

The reference method parameters are usually specified in standards or other discipline-specific documents as the so-called guides. If such documents are unavailable, the drying temperature that does not cause the sample to change colors is used. Such an approach applies to previously dehydrated products and raw products.

SAMPLE PREPARATION

Before testing, the sample must be stored in a tightly sealed container. When it takes a form of granules, the sample must be mechanically fragmented into small pieces. Semi-fluid samples must be mixed.

ACCESSORIES

Laboratory dryer, glass weighing vessels with a lid, AS 220.X2 analytical balance, laboratory spoon.

METHOD DESCRIPTION

Place the sample with a mass of ca. 5 g in pre-dried glass weighing vessels. Specify the real mass of the sample in question with the use of the balance whose weighing accuracy is 0.1 mg (AS 220.X2). Put weighing vessels with the sample and lids into the temperature-controlled laboratory dryer. Dry sample at the temperature of 105°C for 24 hours. After this period, remove vessels, put them into the desiccator to let them cool down and then weigh. Place samples in the laboratory dryer again and keep on drying them for 30 minutes. Cool them down and weigh again. Repeat the procedure until you obtain a stable sample mass or record the sample mass growth after drying.

RESULTS

Sample name	**REFRACTORY MATERIALS**			
Type	**SILICEOUS MEAL**		**CALCIUM SILICATE**	
Kind	1-A	1-B	2-A	2-B
Dry matter content (%)	72.09	72.24	7.18	7.02
Standard deviation (%)	0.01	0.01	0.02	0.02

CALCIUM SILICATE – DRY MATTER CONTENT ANALYSIS WITH THE MOISTURE ANALYZER

The water content testing with the use of the moisture analyzer (IR radiation) entails two phenomena: convection and radiation. The sample temperature rises from outer layers to the bottom of the sample. The temperature gradient in the sample structure minimizes through optimization of the thickness of the dried sample and drying temperature.

SAMPLE PREPARATION

Before testing, the sample must be stored in a tightly sealed container. Before testing, samples in the form of granules must be mechanically fragmented into small pieces. Semi-fluid samples must be mixed.

ACCESSORIES

MA R, MA X2, MA X7 or MA 5Y moisture analyzer, laboratory spoon, disposable aluminum weighing pans, glass fiber filters.

METHOD DESCRIPTION

Set drying parameters presented below. Arrange the calcium silicate sample with a mass of 1.5 ÷ 2 g on the pre-dried filter. The meal sample must be scattered evenly on the weighing pan. Lock the drying chamber manually or automatically.

DRYING PARAMETERS / RESULTS

	REFRACTORY MATERIALS			
Type	**SILICEOUS MEAL**		**CALCIUM SILICATE**	
	1-A	1-B	2-A	2-B
Drying profile	Standard			
Drying temperature	120°C	130°C	115°C	120°C
Sample mass (g)	~ 2			
End of analysis	Auto 3	Auto 3	Auto 1	
Dry matter content (%)	72.10	72.34	7.26	7.01
Standard deviation (%)	0.08	0.05	0.19	0.01
Analysis time $\acute{x}$ (min)	5	4	19	17

ACCURACY OF THE MA R, MA X2, MA X7, MA 5Y METHOD

Type	**SILICEOUS MEAL**		**CALCIUM SILICATE**	
	1-A	1-B	2-A	2-B
Dry matter – Ref. (%)	72.09 ± 0.01	72.24 ± 0.01	7.18 ± 0.02	7.02 ± 0.02
Dry matter – MA (%)	72.10 ± 0.08	72.34 ± 0.05	7.26 ± 0.19	7.01 ± 0.01
Analysis accuracy (%)	|0.01|	|0.10|	|0.08|	|0.01|

RESERVATION

The method in question has been verified by the Research Laboratory, yet the results do not include factors arising from diversity of tested samples, operators' personal skills as well as measuring capability used by moisture analyzer users. For this reason Radwag shall not be held responsible for drying parameters but they can be used to elaborate own drying method.