COCOA

water content determination

The surplus of water in a powder product, for example cocoa, has a negative influence on its technological quality and use-by date. From the technological point of view, the surplus of water causes the transported or stored sample to lump, which deteriorates other physical features of this material. This is important because cocoa is used in numerous fields of the food industry as an ingredient of chocolate products, ice-creams, desserts, cakes, etc. Customers' expectations regarding the ready-made product are related to good taste, durability, suitable aroma and reproducibility of these features with reference to further products of this sort. Testing water content in such products as cocoa is therefore essential for production processes and when you finally assess its quality. A reliable and quick method in this respect is moisture analyzers by Radwag.

The application note includes basic information for validation of the cocoa drying method with the use of MA/R and MA/X2 moisture analyzers by Radwag Wagi Elektroniczne. The application note may be the basis for elaborating own drying method with a special regard to distinctive features of the product in question.

Metrology, Research and Certification Center, Radwag Wagi Elektroniczne, Poland
Toruńska 5, 26-600 Radom, Poland +48 48 386 60 00, e-mail: office@radwag.com, www.radwag.com

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

In view of hygroscopic nature of the sample, before testing it must be stored in a tightly sealed container. Stir the sample before testing.

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 samples at the temperature of 105°C for 3 hours (dark cocoa) and at the temperature of 90 °C (instant cocoa). After this period, remove vessels and put them into the desiccator to let them cool down and weigh afterwards. 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 or record the sample mass growth after drying.

RESULTS

Sample name	DARK COCOA	INSTANT COCOA
Water content (%)	2.19	0.98
Standard deviation (%)	0.02	0.003

COCOA – WATER 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. Too high drying temperature may lead to surface burning of the sample, which may be hard to diagnose when the sample color is dark.

SAMPLE PREPARATION

Before analyzing, store samples in locked containers due to their hygroscopic nature. Stir the sample before you collect it for testing.

ACCESSORIES

MA/R or MA/X2 moisture analyzer, laboratory spoon, disposable aluminum weighing pans.

METHOD DESCRIPTION

Set drying parameters presented below. Collect the sample with a mass of ca. 3 g and distribute a thin layer of the sample throughout the weighing pan. Lock the drying chamber manually or automatically.

DRYING PARAMETERS / RESULTS

Sample name	**DARK COCOA**	**INSTANT COCOA**
Drying profile	Standard	
Drying temperature	90°C	70°C
Sample mass (g)	~ 3 ÷ 4	
End of analysis	Auto 1	Auto 3
Water content (%)	2.07	0.96
Standard deviation (%)	0.03	0.009
Analysis time $\acute{x}$ (min)	4	

ACCURACY OF THE METHOD MA/R ÷ MA/X2

Sample name	**DARK COCOA**	**INSTANT COCOA**
Humidity – Ref. (%)	2.19 ± 0.02	0.98 ± 0.003
Humidity – MA R/X2 (%)	2.07 ± 0.03	0.96 ± 0.009
Analysis accuracy (%)	|0.12|	|0.02|

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.