1. Aim of the Extraction / Principle

For coffee manufacturers it is of utmost importance to know how much of the used coffee powder is ultimately ending up in the coffee solution, or better, how many flavouring substances are transferred from the coffee powder into the solution when coffee is brewed in a standard coffee machine.
In order to find this out, 15 g coffee powder and 250 ml water are used in a standard procedure to brew a coffee. After concentrating this coffee, brown oil is found which is absorbed using a filter pad. The pad is then dried and analysed.

The sample is extracted with n-hexane. After extraction, the solvent is distilled and the residue is dried and weighed. The extract content is calculated as the difference of weight at the start and the end of the analysis.

2. Method

C. Gerhardt application

3. Chemicals

Quality: p.a.
3.1. n-hexane

4. Instruments

4.1. Analytical balance, precision 0.1 mg
4.2. Desiccator, with a drying agent, e.g. Blaugel
4.3. SOXTHERM extraction unit macro with MULTISTAT, cat. no. 13-0011,
or SOXTHERM Manager, cat. no. 13-0012
4.4. Drying oven, heated electrically, with natural aeration and automatic temperature control with ± 2 °C precision
4.5. Cotton wool, chemically clean and fat-free

5. Analysis

5.1. Preparation of the Extraction Beakers

3 - 5 boiling stones are put into each extraction beaker. The beakers are dried in the drying oven for about one hour at 103 °C ± 2 °C. After cooling down to room temperature in the desiccator, the beakers are weighed with a precision of 0.1 mg.

5.2. Sample Preparation

The filter pads containing the coffee extract are dried in the drying oven until a constant mass is reached (cool down in the desiccator). Then, they are transferred into the extraction thimbles and are covered with cotton wool (4.5.).

5.3. Extraction

The extraction thimbles together with the thimble holders are inserted into the extraction beakers.
After adding 150 ml extraction solvent (3.1.), the samples are extracted after the following procedure:

Extraction solvent:	n-hexane
Boiling point:	68.9 °C

Parameters for the Instruments and Connections:

Size of the extraction beakers:	macro, cat. no. 13-0050
Type of seal:	Viton, cat. no. 1000578
Extraction thimbles:	Type SE33B, 33 x 94 mm, cat. no. 13-0057
Holder for thimbles:	SHK2, cat. no. 13-0062
Boiling stones:	cat. no. 1000774
Connection for compressed air or compressor:	cat. no. 13-0010 resp. 1005873, or 4.5 bar minimum
Water connection or recirculating condenser:	0.5 bar minimum

Parameters for the Program:

Program Step	Parameter	Comment
T-Classification	200 °C	
Extraction Temperature	180 °C	
Reduction Interval	4 min	
Reduction Pulse	2 s	
Hot Extraction	30 min	Sample must be immersed completely
Evaporation A:	4 intervals	After A the level of the solvent should be at least 10 mm below the thimble.
Rinsing Time	180 min	
Evaporation B:	2 intervals	After B the extraction beaker should be more or less free of extraction agent.
Evaporation C:	5 min	

After the program has finished, the extraction beakers are dried in the drying chamber for 60 minutes at 103 °C ± 2 °C. Then, they are left to cool down to room temperature in the desiccator and weighed with a precision of 0.1 mg. In order to check the weight consistency, the samples are dried for another 15 minutes and weighed again after cooling down. This procedure is repeated as long until the difference between two successive weighings does not exceed 0.1 % of the initial sample weight. Should the weight increase, then the previous lower value must be taken. Extraction, drying and weighing must be carried out immediately after each other.

6. Results

6.1. Calculation

The extract content w in mg is calculated as the sample weight difference between the start and the end of the analysis (weight of extraction beaker with extract minus weight of empty extraction beaker).

6.2. Samples of a Result

sample	amount of extract received [mg]
1	28.6
2	26.0