AGGREGATE STABILITY

You will return to the contents of P1 SOIL by clicking the pictogram

The aggregate stability of a soil is the resistance of soil structure against mechanical or physico-chemical destructive forces. Soil structure is one of the main factors controlling plant growth by its influence on root penetration, soil temperature and gas diffusion, water transport and seedling emergence and therefore it is an important soil characteristic for farmers.

Soil structure is defined by the combination or arrangement of primary soil particles into compound elements, which are separated from adjoining structural elements by surfaces of weakness. Soil texture, soil structure, and the type of clay mineral, organic matter content and type, cementing agents and cropping history influence the aggregate stability.

Among the mechanical destructive forces are soil tillage, impact of heavy machinery, treading by animals and raindrop splash. Physico-chemical forces are e.g. slaking, swelling and shrinkage, dispersion and flocculation.

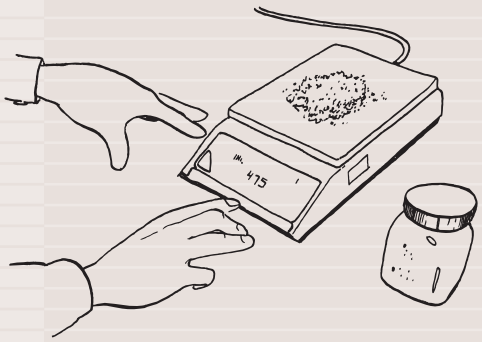
Slaking is the process of structure breakdown under the influence of wetting of soil aggregates, due to swelling of clay minerals, dissolving of cementing agents, air explosion or reduction in pore water suction. Slaking may result in the formation of a superficial crust, reducing water infiltration and enhancing sediment loss by downward transportation with surface runoff water.

08.13 Wet sieving apparatus, complete set to determine the aggregate stability of soil

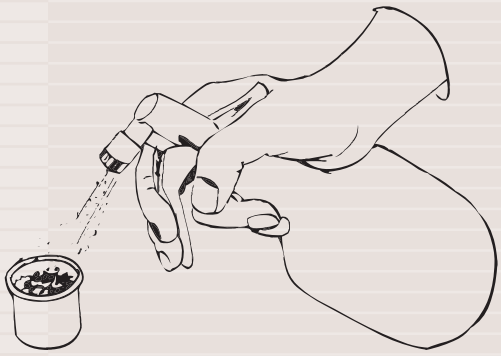
The wet sieving apparatus is used to determine the above mentioned aggregate stability. The standard set includes a shaking machine for wet sieving method (incl. 100-240 VAc adapter), suitable for 8 sieves, stainless steel Ø 64x45 mm, sieve cans Ø 39x39 mm with sieve opening 0.250 mm and sieve surface of 10.2 cm^2. Optional are sieves with various openings 2,0 - 0.045 mm

The wet aggregate stability is determined on the principle that unstable aggregates will break down more easily than stable aggregates when immerged into water.

The sample material is weighed.



The samples are pre-moistened with water vapour, using a very fine plant sprayer.



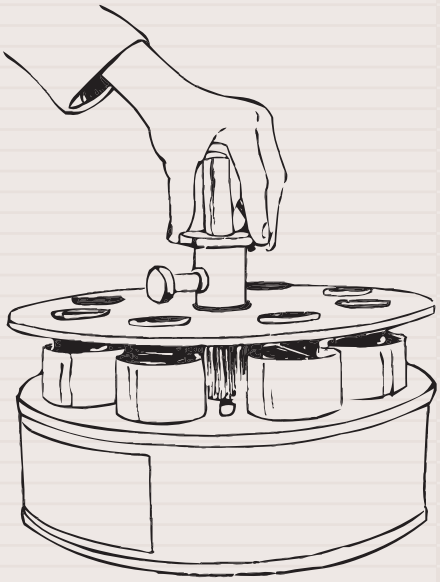
Wet sieving apparatus, complete set with accessories

Eijkelkamp Agrisearch Equipment

www.eijkelkamp.com

AGGREGATE STABILITY

The cans are placed in the lower position to immerge the samples.



To determine the stability, 8 sieves are filled with a certain amount of soil aggregates. These sieves are placed in a can filled with water, which will move up and downward for a fixed time. Unstable aggregates will fall apart and pass through the sieve and are collected in the water-filled can underneath the sieve. The testing procedure results in an index for aggregate stability.

Advantages

- Easy operation through the central knob of the sieve holder.
- The cans can be easily filled and filled-up with water through the special can-fill openings in the sieve-holder.
- The sieve-holder can be set and locked in the leak-out position while the sieves are still straight above the cans preventing the spoil of aggregates.
- The sieve-holder can be put in the bottom position, independently the position of oscillating mechanism, so it is easier to control the water level in the cans.
- Build-in oscillating mechanism and electric motor.
- Electric 12/24 Vdc motor with external adapter for safe use in wet conditions.
- World wide universal adapter (input 90 to 264 Vac) complete with interchangeable mains plugs for international use.

Applications

Applications of the wet sieving apparatus are the fields of agriculture and land conservation (research on soil erosion, land degradation/ conservation, salinization, agriculture, sustainable agriculture). Determining aggregate stability will give information on the sensitivity of soils to water and wind erosion, which might be prevented e.g. by mulching the soil surface. Information on soil aggregate stability can also improve tillage programs, adapted to the specific soil type and crop demands.

Sieves with openings 2.0 - 0.045 mm.

BENEFITS

08.13 Wet sieving apparatus

- Determines susceptibility for (splash) erosion
- Works based on simple disturbed samples
- Sieve out the grains from 1.00 to 2.00 mm
- Grains 1.00-2.00 mm are shaken with water
- Grains falling apart are measured
- Pre-programmed grain-wash time
- 8 Inert beakers allow using chemicals
- Universal 100-240 Vac power plug

CALCIMETER

P1.85

The carbonate content of the soil is a sure indication of the fertility of the soil. To be able to determine the carbonate content of the soil Eijkelkamp (together with Dutch research institutes) developed a calcimeter that meets the standards NEN 5757 and DIN 19682 and 19684.

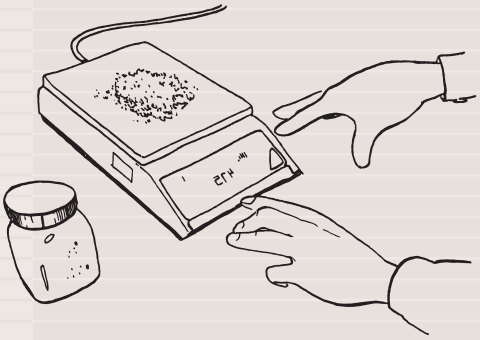
The calcimeter works in accordance with the method of Scheibler. The method Scheibler involves a determination of the carbonate content in the soil based on a volumetric method.
The carbonates present in the sample are converted into CO_2 by adding hydrochloric acid to the sample. As a result of the pressure of the CO_2 released, the water in a burette that is de-aerated, rises. The difference in level measured is an indication for the released quantity of CO_2, from which the carbonate content can be calculated. The carbonate content is expressed as an equivalent calcium carbonate content. Advantages by comparison to other methods (for instance the Wesemael- and Anderson methods) are:

- ❒ No oven required to dry the silica gel.
- ❒ No other chemicals needed.
- ❒ No long waiting periods.
- ❒ No very accurate weighing equipment needed.
- ❒ Less vulnerable glass parts.
- ❒ It is easier to determine the content using the volumetric method then by weighing the gas.

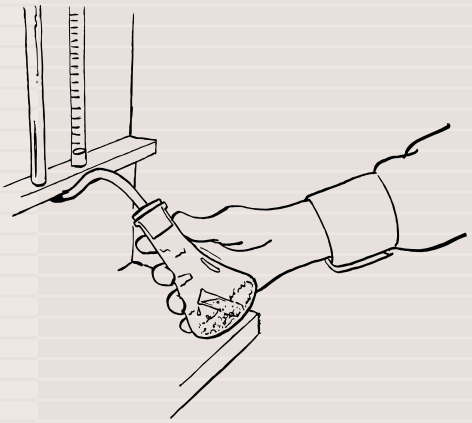
08.53 Calcimeter for determination of the carbonate content

The calcimeter by Eijkelkamp is suitable for the simultaneous determination of the carbonate content in 5 samples. Where possible the vulnerable glass was replaced by synthetic materials. Because hydrochloric acid is used a stable and ergonomic design was chosen. The calcimeter is delivered complete with reaction vessels and test tubes (without reagents).
Per reaction approximately one hour is required. Carbonates that are hard to dissolve, such as sea shells, take more reaction time.

The prepared sample material is weighed.



By holding the reactor vessel under an angle the hydrochloric acid flows from the test tube across the sample.



Calcimeter

Eijkelkamp Agrisearch Equipment

www.eijkelkamp.com

P1.85

CALCIMETER

The quantity of sample needed is determined beforehand by treating a part of the sample with hydrochloric acid on a watch glass. The carbonate content is estimated on the basis of the extend and the period of bubbling. Based on this estimate the quatity of sample for the analysis is determined.

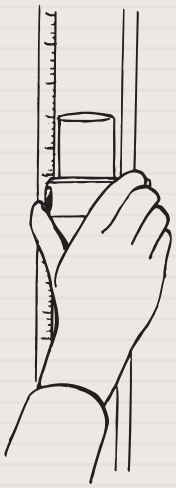
With this calcimeter no balloon is used to keep the CO_2 separate from the water (to prevent any gas from dissolving in the water). This results in much more accurate measuring results.

As a consequence of the repeatability and the accuracy, a series of measurements should be executed in a room in which there are no differences in temperature exceeding 4°C. In addition the reagents used must meet the standards for analysis.
It should also be considered that other gasses (for instance in polluted soils) may be released.
The gas will then have to be purified first and the CO_2 will have to be determined otherwise.

Advantages

- ❒ The apparatus is easy to control.
- ❒ It is possible, by contrast to other equipment, to process multiple samples simultaneously.
- ❒ A very stable and gas-proof system.
- ❒ Compact, ergonomic design.
- ❒ Less vulnerable glass parts.
- ❒ Not tied to a fixed location in the laboratory (moveable).
- ❒ Adjusting is easy.
- ❒ Meets the standards NEN 5757 and DIN 19682 and 19684.

Setting the zero level.



Buffer vessels of the calcimeter

BENEFITS

08.53 Calcimeter

- Accurate measurements the easiest way
- 5 flasks allow batchwise working
- Rapid results
- Modern tool to suit the professional lab

AIR PYCNOMETER

In general the soil consists of various substances:

- ❒ Solid mass: mineral- and organic parts.
- ❒ Soil humidity: mainly water.
- ❒ Soil air: a mixture of several gasses and vapors.

If the soil contains water and air there must be pores between the solid particles.

For many reasons it is important in forestry and agriculture as well as in soil and water management studies to know the ratio of the different components.

Growth is hampered if there is not enough water and air, and the soil is less suitable for agriculture if it is too porous: the strength of ground is reduced.

It is important, therefore, to know the ratio between the amount of solid mass, water and air in a given volume.

The air pycnometer has been developed to determine the volume and the density of the solid components (for instance soil).

The apparatus is also extremely suitable to measure the volume of irregular shaped objects (provided they are not too big).

With the data obtained it is possible to calculate the specific weight.

08.60 Air pycnometer according to Langer

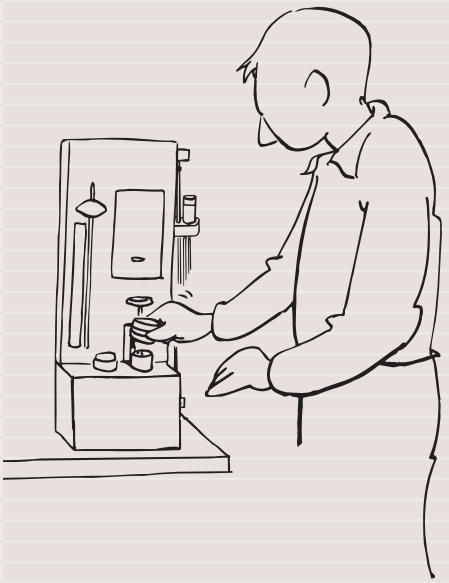
The air pycnometer is supplied as a complete set, including a calibration block.

The apparatus is suited for sample rings with a maximum diameter of 53 or 60 mm (max. height 51 resp. 40 mm). The instrument has a measuring range of 0-115 cm^3.

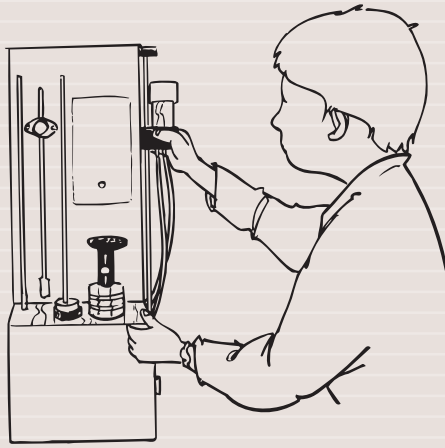
The time period of the measurement is approximately 1 minute. The maximum measuring accuracy equals 1%.

Air pycnometer according to Langer

The vacuum bell is placed over the sample.

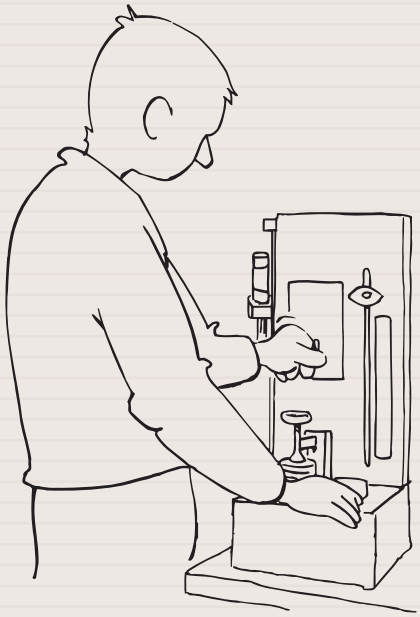


As soon as the under pressure is stable the value can be read and the levelling vessel is placed in the upper position.



AIR PYCNOMETER

After the leveling vessel has been placed in the upper position the de-aeration cock is placed in position 0.



The principle

An under pressure is created in the vacuum bell in which the object to be measured is placed.

Depending on the gas volume present in the bell, more or less air will be extracted. The quantity of the air present is independent of the volume taken by the object to be measured.
After the under pressure has stabilized the volume of the object can be read from the calibrated scale.

Applications

The pycnometer is applied where there is an interest in knowing the specific weight.

- Soil research, for instance the determination of the porosity of soil samples.
  It is recommended to use soil sampling rings with a 100 cc contents when taking undisturbed soil samples.
- Powder- and granulate research in the pharmaceutical industry.
- Measuring the pore volume of tarmac (road construction) or clay and bricks (brickworks).
- Volume determinations of seeds, coffee beans, legumes, etc. in the food industry.

Limitation: Temperature variations influence the measurements (can be prevented by climate control in the laboratory).

Measuring scale

Vacuum bell

Various objects can be measured

BENEFITS

08.60 Air pycnometer

- Simple calibration
- Fast measuring procedure
- The volume can be read immediately and accurately

Art.no.	Description	Qty. in set
Aggregate stability (P1.84)		
	To determine the aggregate stability of soils a so-called wet sieving apparatus is supplied	
08.13	**Wet sieving method, complete set to determine the aggregate stability of soil**	
**08.13.01	Shaking machine for wet sieving method, suitable for 8 sieves, incl. adaptor 100-240 Vac	1
**08.13.05	Stainless steel can for wet sieving method, Ø 64x45 mm	16
**08.13.04.08	Sieve can for wet sieving method. Dimensions: Ø 39x39 mm, sieve opening 0.250 mm, sieve surface 10.2 cm²	8
	Optional item (for weighing the sample used in the apparatus):	
98.02.03	Electronic pocket balance, capacity 320 gram, accuracy 0.1 gram. With 3 batteries of 1.5 V. Dimensions weighing plate 80x70 mm.	
	Optional sieve cans with different meshes:	
08.13.04.02	Sieve can for wet sieving method. Dimensions: Ø 39x39mm, sieve opening 2.0 mm, sieve surface 10.2 cm²	
08.13.04.04	Sieve can for wet sieving method Dimensions: Ø 39x39 mm, sieve opening 1.0 mm, sieve surface 10.2 cm².	
08.13.04.06	Sieve can for wet sieving method. Dimensions: Ø 39x39 mm, sieve opening 0.5 mm, sieve surface 10.2 cm²	
08.13.04.10	Sieve can for wet sieving method. Dimensions: Ø 39x39 mm, sieve opening 0.125 mm, sieve surface 10.2 cm²	
08.13.04.12	Sieve can for wet sieving method. Dimensions: Ø 39x39 mm, sieve opening 0.063 mm, sieve surface 10.2 cm²	
08.13.04.14	Sieve can for wet sievingmethod. Dimensions: Ø 39x39 mm, sieve opening 0.053 mm, sieve surface 10.2 cm²	
08.13.04.16	Sieve can for wet sieving method. Dimensions: Ø 39x39 mm, sieve opening 0.045 mm, sieve surface 10.2 cm²	
Calcimeter (P1.85)		
	To determine the carbonate content in soil samples a calcimeter is supplied.	
08.53	**Calcimeter for determination of the carbonate content ofamongst others soil samples, according to NEN 5757 and DIN 19684 (part 5). System suited for 5 samples. Complete with Erlenmeyer flasks (set of 10 pcs.) and test tubes (set of 100 pcs).**	
	Spare parts for calcimeter:	
08.53.01	Erlenmeyer flask for calcimeter (contents 250 ml) set of 10 pieces	
08.53.02	Test tube for calcimeter, set of 100 pieces	
Air pycnometer (P1.86)		
	The pycnometer we supply has been developed for the determination of the volume and density of solid substances (such as soil samples).	
08.60	**Air pycnometer according to Langer, complete apparatus incl. calibration block (excl. mercury - 1500 grams required technical pure). Suitable for amongst others: soil sample rings Ø 53 and 60 mm, max. height 51 resp. 40 mm, contents 100 ml**	
	We provide two types of soil sample rings for the pycnometer: **- Ø 53 x 50 mm** **- Ø 60 x 56 mm** **The soil sample rings can also be supplied together with sampling equipment as complete standard sample ring kits.**	
07.01.53.NN	Aluminium case with 24 soil sample rings, Ø 53x50 mm height 51 mm, contents 100 cc max. deviation less than 0.5 %, incl. 48 plastic covers Ø 53 mm (rings numbered 1 to 24)	
07.01.60.NN	Aluminium case with 24 soil sample rings, Ø 60x56 mm, height 40.5 mm, contents 100 cc, max. volume deviation 0.5 %, incl. 48 plastic covers Ø 60 mm (rings numbered 1 to 24)	
07.53.SC	Sample ring kit model C, standard set to a depth of 2 m. For soil sample rings Ø 53 mm	
07.60.SC	Sample ring kit model C, standard set to a depth of 2 m. For soil sample rings Ø 60 mm	