Application Bulletin

Of interest to:	Agricultural research institutions Horticulture Construction companies	A 2, 8

Determination of the pH value and redox potential in soil samples

Summary

The pH value and redox potential of soil give important information about its properties. Knowledge of these values enables predictions to be made concerning plant growth, bacterial activity, fertilisers that may be needed, possible corrosive effects on buildings, etc.

Instruments and accessories

- 2.713.0010 pH Meter (with RS 232C interface) or
- 2.744.0014 pH Meter
- 2.704.0020 pH Meter (for field measurements)
- 6.0227.100 combined LL flat membrane pH glass electrode
- 6.0226.100 combined LL penetration pH glass electrode (for field measurements)
- 6.0451.100 combined Pt ring electrode
- 6.2104.020 electrode cables

Reagents

- Buffer solution pH = 4.00, 500 mL (Metrohm no. 6.2307.100)
- Buffer solution pH = 7.00, 500 mL (Metrohm no. 6.2307.110)
- Potassium chloride solution c (KCl) = 3 mol/L, 1000 mL (Metrohm no. 6.2313.000)
- Potassium chloride solution c(KCl) = 1 mol/L
- Distilled or demineralised water

Measurements

pH measurement in the field

The 704 pH Meter is calibrated as described in the Instructions for use. Put the 6.0226.100 penetration pH electrode into the soil, turning it slightly, and read off the pH value. If the soil is sandy or very dry, it should first be moistened with a little dist. water. The final value usually appears after about 1 min.

pH measurement in the laboratory

Suspension with dist. water

This method determines the present acidity of the sample. Form a slurry consisting of 25 g air-dried soil and 65 mL dist. water. The suspension should be intensively stirred or shaken for 5 min. Allow to stand for at least 2 h, but not more than 24 h (it is best to allow it to stand overnight). After this time measure the pH value of the suspension. During the measurement the suspension should be stirred and it is recommended to use, if possible, the 6.0227.100 flat membrane pH electrode.

Suspension with c(KCl) = 1 mol/L

If the measurement is carried out after the addition of KCl, the present exchange acidity will be obtained. KCl causes an exchange of aluminium and iron ions out of the silicates. These in turn form hydrogen ions by hydrolysis.

Proceed as described under «Suspension with dist. water», but add 65 mL c(KCl) = 1 mol/L instead of dist. water. For the reasons given above, the pH values obtained will be somewhat lower than when dist. water is used. Depending on the composition of the soil, the difference may be up to 0.5 pH units.

Measurement of the redox potential in the laboratory

Shake 25 g of the soil sample with 50 mL dist. water in an Erlenmeyer flask for 5 min. After this time, immerse the 6.0451.100 Pt ring electrode in the suspension and measure the redox potential. It is important to stir the sample during the measurement to keep the suspension from settling. Depending on the composition of the soil, the final value will be reached after 30 ... 50 min. For this reason the reading should, on principle, only be taken after 50 min have elapsed. The electrode is to be checked from time to time (see Application Bulletin No. 48) and cleaned, if necessary.

Literature

- W. Kordatski,
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  Verlag Rudolf Müller & Steinicke, München.
- R. S. Evans,
  A Dictionary of pH Applications,
  The Herbert Publishing Co. Ltd., London.
- DIN/ISO 10390: 1997,
  Soil quality / Determination of pH.