CARBONATE REMOVAL FROM SOILS BY A MODIFICATION OF THE ACETATE BUFFER METHOD

The Lincoln Soil Survey Laboratory is engaged in the characterization of highly calcareous soils as part of a study of the genesis of soils in a Desert Region. Removal of the carbonate prior to analyses is mandatory for many of the soils because of strong carbonate accumulation. The characterization measurements on the samples treated to remove carbonate include particle-size distribution, cation-exchange capacity, organic carbon, nitrogen, and free iron.

The procedure adopted for carbonate removal uses pH 5 NaOAc buffer. Samples are held in dialysis membranes during the buffer treatment and are desalted by dialysis against tap water.

Jackson describes a procedure for the removal of carbonate from soils with pH 5 NaOAc buffer. In Jackson's procedure, the samples are treated in beakers, and the excess salts are removed by centrifugation and decantation. We believe the procedure described below is more practicable for treatment of the large samples necessary for soil characterization.

Procedure

Dialysis membranes are made from 5/2-inch wide cellulose casing (Visking Company), using large rubber bands to tie the bottom. When not in use, the membranes are kept in buffer. Sample size depends on the carbonate content and the > 2-mm. percentage of the noncalcareous fraction; for very gravelly and highly calcareous horizons, as much as 6 kg. have been treated. The sample is placed in the dialysis membrane and about 1 liter of pH 5 NaOAc buffer is added. The top of the dialysis membrane is then tied around a glass breather tube about 4 inches long and the assembly is hung in a reservoir of 60 liters of buffer held in a 20-gallon plastic garbage can. If carbonate is present and being dissolved, kneading the membrane will release bubbles of CO₂. When bubbles of CO₂ are no longer evident on kneading, the dialysis membrane is opened and the coarser material checked for carbonate coatings with strong acid (carbonate remains longer in the coarser material). When free of carbonate, the sample is desalted by dialysis against tap water flowing continuously through a large plastic garbage can. The ionic concentration inside the membrane is checked by conductivity measurements on a small volume of the supernatant liquid poured out through the breather tube; dialysis is continued until the salt concentration drops below 10 meq per liter.

The procedure to dry the samples depends on the > 2-mm. fraction has been removed before buffer treatment. The following procedure is used if the > 2-mm. fraction has been removed: Excess water from the sample in the membrane with the membrane is then kneaded to mix it and placed in contact with ethyl alcohol to air-dry. Finally, the sample is removed from the 2-liter beakers, and the > 2-mm. material is air-dried. During filtering the membranes in 2-liter beakers that contain about 500 ml. The water in the beakers keeps the membranes moist and facilitates filtering by collapsing the membrane around the filter candle.

The following procedure is used if > 2-mm. material is present in the buffer-treated sample: The sample in the membrane is first wet-sieved through a sieve with 2-mm. openings. The separated > 2-mm. fraction is sieved, and the < 2-mm. fraction from the > 2-mm. fraction is added to the < 2-mm. fraction from the original wet sieving. Most of the water is removed from the < 2-mm. fraction with filter candles; and the sample is transferred to drying pans, using ethyl alcohol. Introduction of ethyl alcohol in the wet samples prevents segregation of clay into durable flakes.