‘Vermiculite’ Determination on Whole Soils by Cation Exchange Capacity Methods[*]

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Abstract: The proposed method is a modification of one by Alexiades and Jackson (1965). Calcium exchange capacity (CaEC) and potassium exchange capacity (KEC) are determined, after removal of organic matter and free iron oxides, by saturating the exchange complex with centrifuge washings of pH 7 acetate solutions of Ca or K, respectively. Excess salt in solutions remaining in contact with the soil after saturation is determined by measuring the weight and concentration of the excess solution. The exchangeable cations and excess salt are then replaced by centrifuge washings with 1 N acetate solutions of Mg (for CaEC) or NH_4 (for KEC), after overnight 110 ° C oven-drying to enhance K fixation for KEC. The replaced cations are determined and CaEC and KEC values are calculated. Per cent ‘vermiculite’ is based on the difference between CaEC and KEC (expressed in m-equiv/100 g) and an assumed ‘vermiculite’ interlayer exchange capacityof 154 m-equiv/100 g; percentage $Vr = (\mathrm{CaEC}-\mathrm{KEC}/154) \times 100$. The ‘vermiculite’ interlayer fraction (*VIF*) of the CaEC may also be calculated; $VIF = \mathrm{CaEC}-\mathrm{KEC}/\mathrm{CaEC}$. The measured ‘vermiculite’ is shown in quotation marks since the method is open to criticism regarding exactly what is being measured, the assumptions made, etc. and to emphasize that the determination procedure is an operational one for the characterization of cation exchange complexes.

Removal of free iron oxides increased both CaEC and KEC values of several soils but percentage *Vr* was little affected. The amount of K fixation was affected by the drying treatment employed after K saturation (none vs air-drying vs oven-drying). Thoroughly crushing Montana and African vermiculites dramatically increased their CEC and measured ‘vermiculite’ values, but had little effect with two samples of saprolite from chloritic metabasalt.

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