THE RELATIONSHIPS OF SPECIFIC SURFACE AREA OF SOIL WITH SOME PHYSICAL PARAMETERS IN SUBHORIZONS OF BRAZILIAN OXISOLS AND OTHER ORDERS

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Specific surface area is an important soil property since most of the physical and chemical reactions occur at the surface of the soil.

The objectives of this work were to measure specific surfaces of several subhorizons of selected profiles for the VIIIth International Soil Classification Workshop (ISCW), with subsequent qualification and assessment of their relations with other physical properties of soils, and to extend the physical characterization of soils, aiming at their classification.

Materials and Methods

For the present paper 22 soil profiles, mostly of the order Oxisols from different regions, were studied. From each profile one subhorizon was taken and analyses performed.

The soil analyses followed the methodology used by EMBRAPA-SNLCS (1979) as presented below in summarized form.

1. Soil surface area: Measured by the EGME procedure of Heilmann, Carter, and Gonzalez (1965) simplified by Cihacek and Bremner (1979). The soil samples were crushed to pass a 0.25 mm screen and dried over P_2O_5 before exposure to EGME. All measurements were performed in triplicate.
2. Water retention at 1 bar: The air-dried, sieved samples (<2 mm) were put in retainer rings on the porous plate. Wet from below, excess water removed, put in a pressure cooker apparatus (Richards 1954), and submitted to 1 bar pressure.
3. Water retention at 15 bars: Same as previous procedure using a pressure plate apparatus (Richards 1954) and ceramic plate of 15 bars and submitted to 15 bars pressure.
4. Total clay: Determined by the modified hydrometer method (Vettori and Pierantoni 1968); no pretreatment to destroy organic matter.
5. Organic carbon: Determined by wet oxidation method with 0.4N $K_2Cr_2O_7$ (Tiurin method).

Results and Discussion

The data on specific surface area, percent of total clay and organic carbon, gravimetric water percent at 1 bar and 15 bars tension, and gravimetric water percent at 15 bars to specific surface ratio for the B subhorizons studied are given in Table 1.

Looking into the data it is seen that the specific surface varies from 25 to 125 m^2 per g. This large range of variation on specific surface is probably due to the combined effects of amount and activity of the organic and mineral colloids.

The linear relationship ($Y = a + bX$), where Y = soil properties and X = specific surface area of soil was observed. A highest correlation coefficient (0.9037 and 0.9090) significant at 1 percent probability was observed between surface area and moisture contents percent at 1 bar and 15 bars tension. Clay and organic matter contents in soil are the principal sources of its total specific surface area. Organic matter content being low in these soils (0.1 to 1.5 percent) was not found to be related with specific area. However, it was evident that clay content could be the only possible source of specific surface area in such soils as seen from a strong association ($r = 0.8796^{**}$) between these parameters.

Conclusions

Based upon 22 soil subhorizons studied, the following conclusions can be made:

1. There was great variability on specific surfaces due to clay content of soils;
2. There was close correlation of specific surface with 1 and 15 bars water content;
3. The relation 15 bars/St has shown great uniformity and, therefore, does not allow separation of soils in different groups.

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Table 1. **Specific Surface, Organic Carbon, Total Clay, Gravimetric Water Percent at 1 Bar and 15 Bars, and Gravimetric Water Percent at 15 Bars to Specific Surface Ratio for the B Subhorizons Studied in the VIIIth ISCW, Brazil**

Pedon number	States[a]	Soil hori-zons	Specific surface area (St)	Organic carbon	Total clay	Water retention 1 bar	Water retention 15 bars	15 bars / St
			(m^2/g)	----------(%)----------				
1	SP	Bo2	97	0.16	41	16.6	14.6	0.151
2	SP	Bo1	113	0.08	67	27.4	25.4	0.224
3	SP	Bo1	47	0.19	34	14.0	10.1	0.215
4	SP	Bo2	102	0.17	76	27.9	22.7	0.223
5	SP	Bto2	120	0.55	78	29.1	27.0	0.225
6	SP	Bo2	125	0.24	76	30.4	29.0	0.235
7	SP	Bo2	102	0.27	76	28.7	23.9	0.234
8	SP	Bo2	110	0.25	73	26.1	23.6	0.215
9	SP	Bo1	60	0.23	41	13.0	12.5	0.208
10	SP	Bo2	25	0.15	22	8.4	7.1	0.284
11	MG	Bo3	116	0.54	87	29.5	26.5	0.228
12	MG	Bov2	89	0.09	65	24.2	21.9	0.246
13	MG	Bo2	27	0.16	18	7.2	6.8	0.252
14	MG	Bo2	102	0.39	72	28.2	25.0	0.245
15	GO	Btol	49	0.33	40	18.2	15.1	0.308
16	GO	Btol	73	0.43	51	21.1	18.1	0.248
17	GO	Bo3	68	0.22	54	19.6	18.8	0.276
18	GO	Bo2	80	0.41	75	28.0	25.7	0.321
19	DF	BAc	103	0.82	83	28.8	26.4	0.256
20	DF	Bo2	95	0.87	80	27.8	26.1	0.275
22	DF	Bol	72	0.69	48	20.2	17.3	0.240
23	DF	Bpg2?	106	0.41	60	25.1	22.7	0.214

[a] SP=São Paulo; MG=Minas Gerais; GO=Goiás; DF=Distrito Federal.

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