

NOTE ON A CHEMICAL METHOD FOR THE EVALUATION OF ALUMINIUM SUBSTITUTED IN IRON OXIDES or/and oxyhydroxides

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(Science du Sol n° 1985/1)

The oxalic acid buffered at pH 3 (SCHWERTMANN, 1964) and the citrate-bicarbonate-dithionite (MEHRA et JACKSON, 1960) are usual reagents for the extraction of Fe, Al and Si from soils samples.

Each has a specific effect. It is well known that the difference between Fe extractable by the oxalic buffer and by CBD has to be attributed to the dissolution of well crystallized Fe oxides and oxyhydroxides in the CBD. If these crystals have aluminium substituted in their structures, then the CBD extracts aluminium in greater quantity than does the oxalic buffer. If silica is extracted at the same rate by the two reagents, the comparison of Fe and Al extracted in both reagents appears to be a good criteria for the diagnose of the Al-substitutions. Moreover, it is possible to calculate a substitution rate (mole %) of the total Fe "oxides".

Examples taken from terra fuscae, sols lessivés and ferralitic soils are given in table I. Four of them were analyzed by Mössbauer spectrometry, spectrometry that confirmed the substitution rates evaluated by the chemical method.

Table I : Chemical analyses and Al-substitutions rates of the selected soil samples.

Réf.	Tampon oxalique			C.B.D.			Taux de substitution (mole) %	Référence:	
	Fe %	Al %	Si %	Fe %	Al %	Si %			
Terra fusca sur calcaire oolithique - Lorraine	1465-2	5,9	4,0	0,4	61,8	11,3	0,5	21	GUILLET (inédit)
Terra fusca sur calcaire sublithographique - Lorraine	1613-1	1,2	2,5	0,6	31,2	4,0	0,5	10	"
B _t - Sol brun lessivé sur limon - Lorraine	1693-4	4,8	2,6	0,6	64,0	5,8	1,4	10	ROUSSEL (1978)
Argile de B _{2tg} - Sol lessivé glossique - Lorraine	1410-12	1,7	2,9	1,3	51,0	9,3	2,0	21	GUILLET (inédit)
B _t - Sol ferralitique lessivé - Tunisie	2045-1	2,2	1,1	0,1	30,0	4,3	0,8	19	SELMI (inédit)
A ₁ - Ferrisol sur cendres argilisées - Colombie	1562-1	4,8	4,7	0,4	25,2	6,0	0,4	11	FAIVRE (inédit)
B _t - Ferrisol sur cendres argilisées - Colombie	1562-3	3,3	3,5	0,3	32,0	7,6	0,2	22	"
B _t - Planosol sur cendres argilisées - Colombie	1561-4	3,3	3,2	0,4	35,8	9,8	0,4	29	"
B - Sol ferralitique à gibbsite - Indes	1290-3	1,0	0,7	0,1	70,0	11,0	0,5	23	JEANROY (1983)
Horizon placique - Sol ferralitique - Colombie	1974-1	11,6	11,6	3,0	112,0	30,0	1,6	27	GUILLET (inédit)
Cuirasse nodulaire de Venturosa - Colombie									
- Nodules à hématite prédominante	VI-A	2,7	3,2	1,3	461,8	37,6	19,3	13	GOMEZ (1981)
- Ciment argileux induré à goëthite	VI-C	12,8	14,3	5,4	369,5	96,8	28,9	32	"

MEHRA (O.P.) et JACKSON (M.L.), 1960. — Clays and Clay Minerals, 7, 317-327.

SCHWERTMANN (U.), 1964. — Pflanzenernähr. Bodenk, 105, 194-202.

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