

Colloidal particle detachment of bentonites

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38 bentonites (incl. 2 ill/smt clays) with natural cation population from all over the world

Fotographs



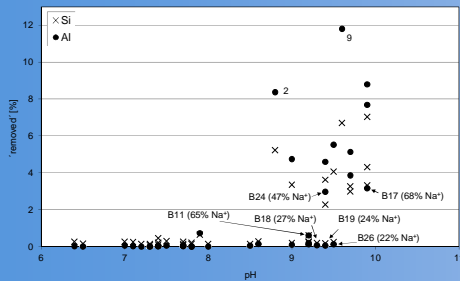
CEC data „pore water“ composition

Sample	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	Al ³⁺	Si ⁴⁺	Fe ³⁺	Other	CEC	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	Al ³⁺	Si ⁴⁺	Fe ³⁺	Other
B01	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
B02	95	5	0	0	0	0	0	0	95	5	0	0	0	0	0	0	0
B03	90	10	0	0	0	0	0	0	90	10	0	0	0	0	0	0	0
B04	85	15	0	0	0	0	0	0	85	15	0	0	0	0	0	0	0
B05	80	20	0	0	0	0	0	0	80	20	0	0	0	0	0	0	0
B06	75	25	0	0	0	0	0	0	75	25	0	0	0	0	0	0	0
B07	70	30	0	0	0	0	0	0	70	30	0	0	0	0	0	0	0
B08	65	35	0	0	0	0	0	0	65	35	0	0	0	0	0	0	0
B09	60	40	0	0	0	0	0	0	60	40	0	0	0	0	0	0	0
B10	55	45	0	0	0	0	0	0	55	45	0	0	0	0	0	0	0
B11	50	50	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0
B12	45	55	0	0	0	0	0	0	45	55	0	0	0	0	0	0	0
B13	40	60	0	0	0	0	0	0	40	60	0	0	0	0	0	0	0
B14	35	65	0	0	0	0	0	0	35	65	0	0	0	0	0	0	0
B15	30	70	0	0	0	0	0	0	30	70	0	0	0	0	0	0	0
B16	25	75	0	0	0	0	0	0	25	75	0	0	0	0	0	0	0
B17	20	80	0	0	0	0	0	0	20	80	0	0	0	0	0	0	0
B18	15	85	0	0	0	0	0	0	15	85	0	0	0	0	0	0	0
B19	10	90	0	0	0	0	0	0	10	90	0	0	0	0	0	0	0
B20	5	95	0	0	0	0	0	0	5	95	0	0	0	0	0	0	0
B21	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
B22	10	90	0	0	0	0	0	0	10	90	0	0	0	0	0	0	0
B23	20	80	0	0	0	0	0	0	20	80	0	0	0	0	0	0	0
B24	30	70	0	0	0	0	0	0	30	70	0	0	0	0	0	0	0
B25	40	60	0	0	0	0	0	0	40	60	0	0	0	0	0	0	0
B26	50	50	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0
B27	60	40	0	0	0	0	0	0	60	40	0	0	0	0	0	0	0
B28	70	30	0	0	0	0	0	0	70	30	0	0	0	0	0	0	0
B29	80	20	0	0	0	0	0	0	80	20	0	0	0	0	0	0	0
B30	90	10	0	0	0	0	0	0	90	10	0	0	0	0	0	0	0
B31	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
B32	10	90	0	0	0	0	0	0	10	90	0	0	0	0	0	0	0
B33	20	80	0	0	0	0	0	0	20	80	0	0	0	0	0	0	0
B34	30	70	0	0	0	0	0	0	30	70	0	0	0	0	0	0	0
B35	40	60	0	0	0	0	0	0	40	60	0	0	0	0	0	0	0
B36	50	50	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0
B37	60	40	0	0	0	0	0	0	60	40	0	0	0	0	0	0	0
B38	70	30	0	0	0	0	0	0	70	30	0	0	0	0	0	0	0

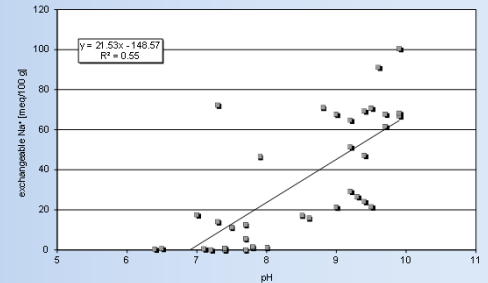
Dispersion in deionized water (1 g / 50 mL) - 48 h end-over-end - ultracentrifugation at 46,000 g

The supernatant was collected and investigated by ICP, turbid supernatants were evaporated for XRD + IR analysis

Details published by Kaufhold & Dohrmann (2008)



The amount of Al/Si measured by ICP represents the sum of dissolved cations and colloidal particles which survived centrifugation. The Al/Si concentration depends on pH and Na₊ content – both parameters are closely related (Kaufhold et al. 2008).

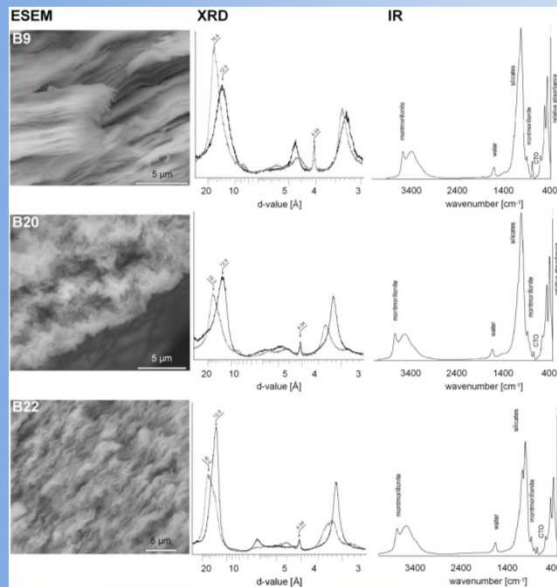


The dispersed solids in each of the centrifugation turned out to still be parts of either the tetrahedral or play a role. However, the solids are still smectites.

XRD confirmed the expandability observed after EG treatment.

In the IR spectrum all typical

Both, XRD and IR show evidence as opal-CT or cristobalite. This the tetrahedral layer may have detachment of very fine smectites.



samples showing turbidity after smectite. The detachment of octahedral layer were thought to which could not be centrifuged

because full swelling to 17 A was

smectite bands were observed.

for the presence of silica, either indicates that some destruction of occurred along with the

Conclusions

The amount of released colloidal particles strongly depended on the amount of exchangeable Na⁺/pH. The actual amount of colloidal particles which will be released from a geotechnical barrier is known to depend on the ionic strength and high ionic strength will reduce the amount of colloidal particles which can be released from the barrier. However, the probability of detachment of colloidal particles will still be larger in case of Na⁺ as dominating exchangeable cation. A fast reequilibration of the exchange population as observed in the ABMI and ABMII are supposed to affect the tendency towards detachment of colloidal particles in a way that the initial cation population becomes less relevant.

Kaufhold, S., Dohrmann, R. (2008) Detachment of colloidal particles from bentonites in water. - Applied Clay Science, 39, p. 50–59.

Kaufhold, S., Dohrmann, R., Koch, D., Houben, G. (2008) The pH of aqueous bentonite suspensions. - Clays and Clay Minerals, 56, 338–343.