Cementing minerals from a municipal solid waste project, Boone County, Kentucky

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By Terry E. C. Keith

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INTRODUCTION

Samples were obtained from an EPA municipal solid waste project test site in Boone County, Kentucky. The drainage from the test site had been filled with rounded gravel but, with time, drainage decreased due to cementation of the gravel by dark-red to orange-brown, fine-grained material. Cementation of the samples studied indicated that effective drainage is already greatly diminished.

METHOD OF STUDY

Cementing material from the samples was hand picked, hand ground with an agate mortar and pestle, and mounted in a water slurry on a glass slide. X-ray diffraction (XRD) was done using a Norelco unit with copper radiation and a focusing monochrometer with a graphite crystal. Samples were run at recording chart speed of 1° per minute and goniometer speed of 1/2 inch per minute from 3° to 70° 2θ.

SAMPLE DATA

The minerals identified as cementing material are listed on table 1. No crystalline Fe oxide or Fe hydroxide showed on XRD traces; however, analysis by atomic absorption showed a significant amount of Fe (J. M. Thompson, written communication, 1981) which must occur as Fe hydroxide amorphous to X-rays. This type of material is not uncommon in soils and groundwater deposits (Mackenzie, 1975; Barnes and Back, 1964).

Table 1. Mineralogical data on cementing material

Sample no.	Description	Minerals identified by XRD (in order of relative abundance)
11-20-80-1A	Dark red cement; relatively hard; coexists with 11-20-80-1B	Quartz Rhodochrosite (with iron) Gypsum
11-20-80-1B	Soft, buff cement; co-exists with 11-20-80-1A	Quartz Rhodochrosite (with iron) Gypsum Sericite
11-20-80-2	Dark red to orange cement; relatively hard	Quartz Gypsum Rhodochrosite (with iron)

SUMMARY

A fine-grained mixture of X-ray amorphous ferric hydroxide, quartz (SiO_2), rhodochrosite with minor Fe component ((Mn,Fe) CO_3), gypsum ($CaSO_4 \cdot 2H_2O$), and a minor amount of sericite ($\simeq KAl_2(AlSi_3)O_{10}(OH)_2$), is being deposited by the present drainage system, cementing the gravels, and sealing the system.

REFERENCES

Barnes, Ivan, and Back, William, 1964, Geochemistry of iron-rich groundwater of southern Maryland; The Journal of Geology, v. 72, p. 435-447.

Mackenzie, R. C., 1975, Classification of soil silicates and oxides in Gieseking, J. E., ed., Soil components, v. 2, p. 1-25.