

COMMENTS ON TETRAHEDRAL HYDROXYLS

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In his note, "Antigorite: superlattice and structural formula," Zussman (1956) discusses, among other things, my comments (McConnell, 1954) on the results of Brindley and von Knorring (1954). Further clarification of these matters seems to be in order.

Commenting on my calculations, he states: "One should also consider the possibility that extra hydrogen atoms occur in the structure as $(\text{OH})^-$ replacing O^{--} ." It would seem obvious that this is exactly what the hypothesis involving tetrahedral hydroxyls calls for. The cogent matter is whether there is an equivalent decline in the number of silicon atoms, such that four hydrogen atoms proxy for each silicon atom and thus produce electrical neutrality.

Zussman points out (his formula (*i*)) that by omitting the 1.26 per cent of H_2O^- it is still possible to obtain tetrahedral hydroxyls. At the same time, however, almost half of the iron is interpreted as occurring in tetrahedral configuration. As he states, there are numerous results to be obtained, depending upon the diverse assumptions involved. My results assume that all of the constituents obtained on analysis occur in the lattice, *i.e.* no "impurities" are assumed to be present. Indeed, no impurities have been found by direct methods.

It is further shown by Zussman that if one assumes all of the iron atoms to have tetrahedral coordination and, simultaneously, if one assumes 2.3 per cent of the water liberated above 100° C. to be an "impurity," there is no need for concluding that hydrogens proxy for silicon atoms. Separately these assumptions seem dubious enough. Together they probably are completely untenable.

Although Zussman states that the case of ortho-antigorite is "not particularly suitable" for the purpose of indicating tetrahedral hydroxyls in phyllosilicates, it seems that he has considerably strengthened my brief arguments on the subject. He has considered an alternative possibility which involves far less plausible assumptions.

REFERENCES

- BRINDLEY, G. W., AND VON KNORRING, O. (1954), A new variety of antigorite (ortho-antigorite) from Unst, Shetland Islands: *Am. Mineral.*, **39**, 794-804.
- MCCONNELL, DUNCAN (1954), Ortho-antigorite and the tetrahedral configuration of hydroxyl ions: *Am. Mineral.*, **39**, 830-831.
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