

## NOTISER

## Note on Boron-carrying minerals

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During spectrochemical studies on various mineral associations it has been found that boron is selectively concentrated as a trace element in certain minerals. The concentrations are of the order of several hundred ppm or higher, while the associated minerals appear to be boron-free, *i.e.* their contents are in any case far below 100 ppm. Below are listed some minerals which are typically enriched in boron, and their observed *maximum* percentages of  $B_2O_3$  in round figures.

Euxenite and blomstrandine .....	0.8
Fergusonite .....	0.2
Samarskite and yttrotantalite .....	0.3
Thorite and orangite .....	0.5
Mosandrite and johnstrupite .....	0.3
Gadolinite .....	2.5
Phenacite .....	0.1
Meliphanite .....	0.5
Vesuvianite .....	2.5
Cordierite .....	0.05
Norbergite .....	0.02
Chondrodite .....	0.05
Humite .....	0.1
Clinohumite .....	0.1
Leucophoenicite .....	0.05

The boron-enrichment in rare earth (metamict) minerals and beryllium minerals (and also certain muscovites) has been discussed earlier (Oftedal 1964a). As to vesuvianite (Oftedal 1964b) and cordierite, conventional crystal chemical considerations based on ionic radii and charges do not seem to explain the boron enrichment, although  $B^{3+}$  may possibly in certain circumstances replace the much larger  $Al^{3+}$ . Still more difficult to explain is the boron enrichment observed in every member of the humite group. Characteristic of these minerals, as distinct from other (B-free) Mg-silicates, is the association of Mg

with OH or F. This association is also found in vesuvianite and probably in natural cordierites. However, spectrograms of several chlorites (from mineral veins) and of brucite did not show any B-lines, so it appears that this characteristic is in itself not decisive. The tendency of the humite minerals to concentrate boron must be due to structural features specific to these minerals. It is hardly possible to point out such features at present. If one might assume a strong tendency for a small part of the  $\text{OH}^-$  or  $\text{F}^-$  to be replaced by  $\text{O}^{2-}$ , this might induce a corresponding substitution of  $\text{B}^{3+}$  for  $\text{Mg}^{2+}$  in spite of the large difference in ionic radii. This process might be called a "double capture". Naturally there is also the possibility that boron might go into some of the tetrahedral positions, but this seems unlikely because in that case boron contents would probably be found in a wide variety of silicate minerals.

#### REFERENCES

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