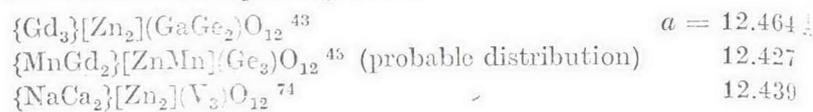


## Group II B

8. Zn
- <sup>2+</sup>
- :
- a*
- sites and possibly
- c*
- sites



See also 1.

9. Cd
- <sup>2+</sup>
- :
- c*
- sites

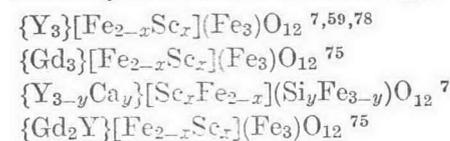


See also Tables 3 and 4.

## Group III B

10. Sc
- <sup>3+</sup>
- :
- a*
- sites

Examples of end-member garnets containing Sc<sup>3+</sup> ions are given in Tables 3 and 4. However, the earliest published report of substitution of Sc<sup>3+</sup> ion in the iron garnets is given in Ref. 73. Some systems studied involving Sc<sup>3+</sup> ion are:



11. Y
- <sup>3+</sup>
- :
- c*
- and
- a*
- sites

See Tables 4 and 5 and the various other examples given in this survey. Also see previous discussion of solid solutions in the Y<sub>2</sub>O<sub>3</sub>—Ga<sub>2</sub>O<sub>3</sub> and Y<sub>2</sub>O<sub>3</sub>—Al<sub>2</sub>O<sub>3</sub> systems.

12. Rare earths: all the trivalent rare-earth ions except that of Pm are known to enter
- c*
- sites in the garnets. Pm
- <sup>3+</sup>
- should also, but as far as I know the rarity of Pm has precluded its being tried. Replacement of at least 1% of the yttrium by Ce
- <sup>3+</sup>
- in YFe garnet has been recently proved
- <sup>79</sup>
- . (Actually, it should be possible to replace 30% of the Y
- <sup>3+</sup>
- by Ce
- <sup>3+</sup>
- ion.) The smaller trivalent ions of Lu, Yb, Tm, Er, Ho, and Dy also enter
- a*
- sites as shown in Table 4. Substitution of Yb
- <sup>3+</sup>
- (in small amount) for Fe
- <sup>3+</sup>
- in

<sup>78</sup> M. A. GILLES and S. GELLER, Substitution for iron in yttrium iron garnet. J. Appl. Physics 29 (1958) 380—381.

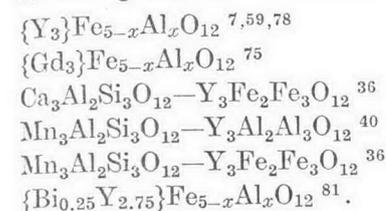
<sup>79</sup> K. A. WICKERSHEIM and R. A. BUCHANAN, Optical studies of exchange in substituted garnets. J. Appl. Physics 38 (1967) 1048—1049.

YFe garnet has been indicated by microwave resonance absorption measurement<sup>80</sup>. Various mixed rare earth iron garnet systems have also been studied.

## Group III A

13. Al
- <sup>3+</sup>
- :
- a*
- and
- d*
- sites

Many examples of end-member garnets containing Al<sup>3+</sup> ion are given in Tables 3—5. In addition, several solid-solution systems including the Al<sup>3+</sup> ion have been studied; some examples are:



14. Ga
- <sup>3+</sup>
- :
- a*
- and
- d*
- sites

Many examples are given in Tables 3—5 and elsewhere in this survey. One of the most extensively studied systems is Y<sub>3</sub>Fe<sub>5-x</sub>Ga<sub>x</sub>O<sub>12</sub><sup>27</sup>, a detailed discussion of which will be given elsewhere in this paper.

15. In
- <sup>3+</sup>
- :
- a*
- sites

The first introduction of In<sup>3+</sup> ion into YFe garnet was reported in 1958<sup>78</sup>. Examples of complete *a* site occupation are given in Tables 3 and 4. There is a possibility that In<sup>3+</sup> ions will enter *c* sites.

## Group IV B

16. Ti
- <sup>4+</sup>
- : prefers
- a*
- sites but enters
- d*
- sites



<sup>80</sup> J. F. DILLON, JR., J. P. REMEIKI and L. R. WALKER, Yb<sup>3+</sup> on octahedral sites in YIG. Bull. Amer. Physic. Soc. [2] 11 (1966) 378.

<sup>81</sup> S. GELLER, H. J. WILLIAMS, R. C. SHERWOOD and G. P. ESPINOSA, Bis-birth substitution in yttrium iron aluminum garnets. J. Appl. Physics 35 (1964) 1754—1756.

<sup>82</sup> S. GELLER, R. C. SHERWOOD, G. P. ESPINOSA and H. J. WILLIAMS, Substitution of Ti<sup>4+</sup>, Cr<sup>3+</sup> and Ru<sup>4+</sup> ions in yttrium iron garnet. J. Appl. Physics 36 (1965) 321.