Table 5. (*Continued*)

A^{3+}	B^{3+}, C^{3+}	a [Å]
Nd	Ga	12.50[58], 12.506[57,67]
Sm		12.355[56], 12.42[58], 12.433[57,67]
Eu		12.402[57,68]
Gd		12.39[58], 12.376[57,68]
Tb		Not reported
Dy		12.32[58], 12.307[57,68]
Ho		12.282[57]
Er		12.25[58], 12.255[57,67]
Tm		Not reported
Yb		12.204[12], 12.200[57,67]
Lu		12.188[12], 12.183[57,68]

12.000 Å. The most accurate value for a stoichiometric $Y_3Al_2Al_3O_{12}$ is probably 12.002 ± 0.002 Å. For non-stoichiometric yttrium aluminum garnets, the lattice constants are generally higher; they contain excess yttrium[56]. RUBENSTEIN and BARNS[60,61] have carefully determined the lattice constants of single crystals of the rare earth aluminum garnets. These are plotted vs atomic number in Fig. 2. If all other points are correct, then the value for YbAl garnet is about 0.003 Å low. The authors have tacitly assumed that the crystals grew with ideal stoichiometry.

ESPINOSA[63] extended studies made by GELLER and coworkers[61,63] to cover all the rare earth iron garnets including hypothetical ones; that is, he determined the lattice constants that the large rare earth iron garnets would have if they existed. GELLER, WILLIAMS and SHERWOOD[64] had done this for Nd, and BERTAUT and FORRAT[62] had done so by extrapolation from two points; namely from $Y_3Fe_2Fe_3O_{12}$ and $\{Y_{1.5}Nd_{1.5}\}Fe_2Fe_3O_{12}$. ESPINOSA[63] found a value of 12.600 Å as compared with our earlier value of 12.596 Å for hypothetical NdFe garnet. GELLER *et al.*[64] found for $\{Y_{3-x}Nd_x\}Fe_2Fe_3O_{12}$, a maximum for x of 1.88. RAMSEY, STEINFINK and WEISS[69] studying this

[67] H. E. SWANSON, M. C. MORRIS, R. P. STINCHFIELD and E. H. EVANS, Standard x-ray diffraction powder patterns. NBS Monograph 25, Section 1 (1962) p. 34.

[68] H. E. SWANSON, M. C. MORRIS, R. P. STINCHFIELD and E. H. EVANS, Standard x-ray diffraction powder patterns. NBS Monograph 25, Section 2 (1963) p. 22.

[69] T. H. RAMSEY, JR., H. S. STEINFINK and E. J. WEISS, A study of neodymium substituted yttrium iron garnet. J. Physics Chem. Solids **23** (1962) 1105–1110.

system later found a maximum x of 1.95, claiming also that they obtained a single-phase garnet with $x = 1.95$ and $a = 12.524$ Å, the maximum they observed, and 0.011 Å larger than our maximum a. We had reported[61] that single-phase garnets were not obtained

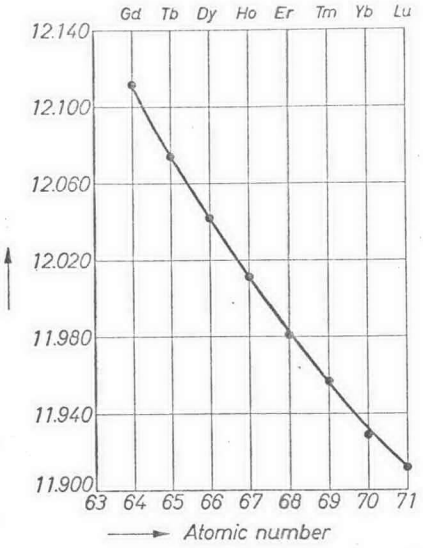

Fig. 2. Lattice constant vs atomic number for rare-earth aluminum garnets. (Data from Refs. [60] and [61])

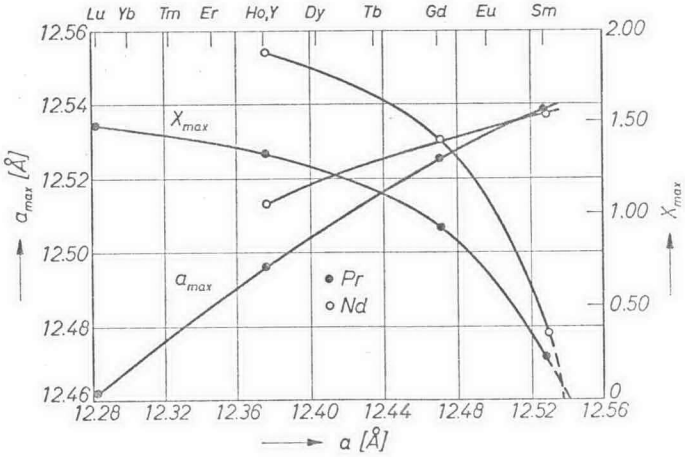

Fig. 3. Maximum lattice constant and maximum x in $\{R_{3-x}Pr_x\}Fe_2Fe_3O_{12}$ and $\{R_{3-x}Nd_x\}Fe_2Fe_3O_{12}$ where R = rare earth or yttrium vs end-member rare earth or yttrium iron garnet lattice constant. (The data for Nd are from Ref.[61], those for Pr from Ref.[63])