DIAGRAMS FOR THE CORRELATION OF UNIT CELL EDGES AND REFRACTIVE INDICES WITH THE CHEMICAL COMPOSITION OF GARNETS

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The compositions of garnets usually may be expressed in terms of five major components, namely almandite, spessartite, pyrope, grossularite, and andradite. Its other components, such as uvarovite, schorlomite, and hibschite, are of very minor importance. If the chemical composition of the garnet is desired in terms of the five important components, without a chemical analysis, Levin's method (1949 abstract), which determines it from the study of the four physical characters, may be used. However, Levin's procedure requires elaborate calculations, unlike the graphical method here described, by which the result is obtained by direct reading.

Ford (1915) found that one-sixth of all analyzed garnets could be represented by only two components (no other greater than 5 per cent) and two-thirds required three components. Taking three components as significant in a garnet, Kennedy (1947) represented the variation in specific gravity and refractive index with the chemical composition of the garnets. But the specific gravity measurements on the garnet are not always as reliable as the unit cell edge measurements. Skinner (1956) measured the unit cell edges of the end component garnets. Hence the present writer has constructed triangular diagrams (Figs. 1–8) correlating unit cell edges and refractive indices with the chemical composition. By referring the unit cell edge and refractive index, determined by x-ray and immerson methods respectively, to these diagrams, the chemical composition can be found in terms of three components of the garnets. Detailed work is in progress to test the diagrams especially with reference to the assumption of the linear variation here made.

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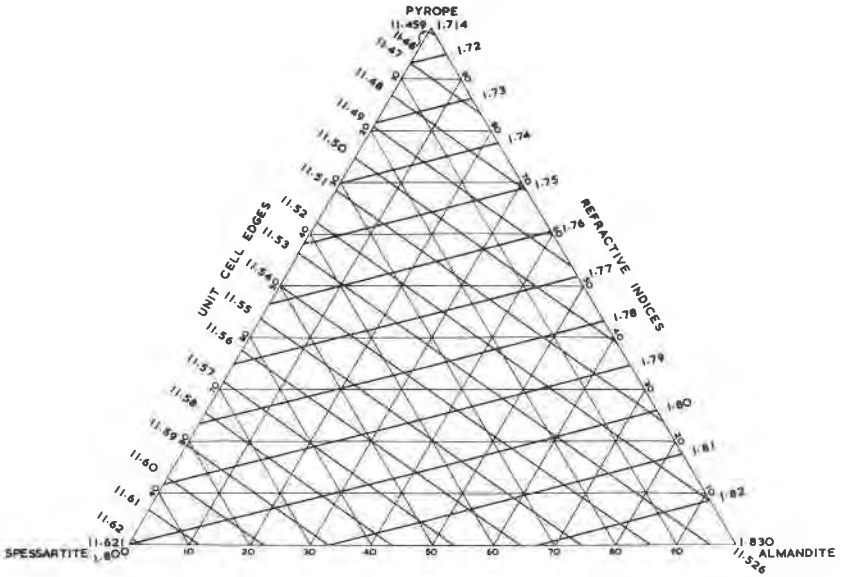

Variation of unit cell edges and refractive indices with chemical composition in the garnet group of minerals.
FIG. 1. Pyrope-spessartite-almandite.

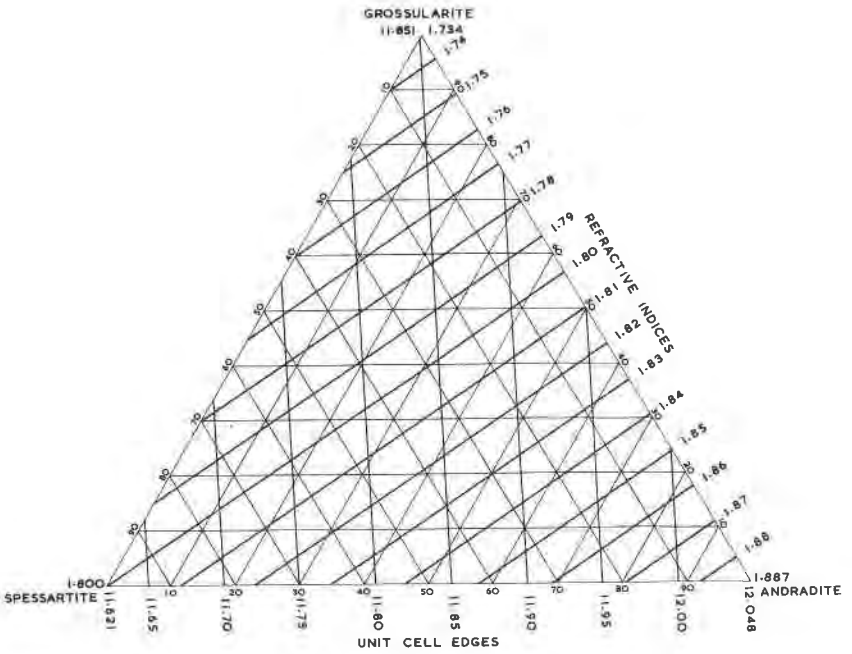

FIG. 2. Grossularite-spessartite-andradite.

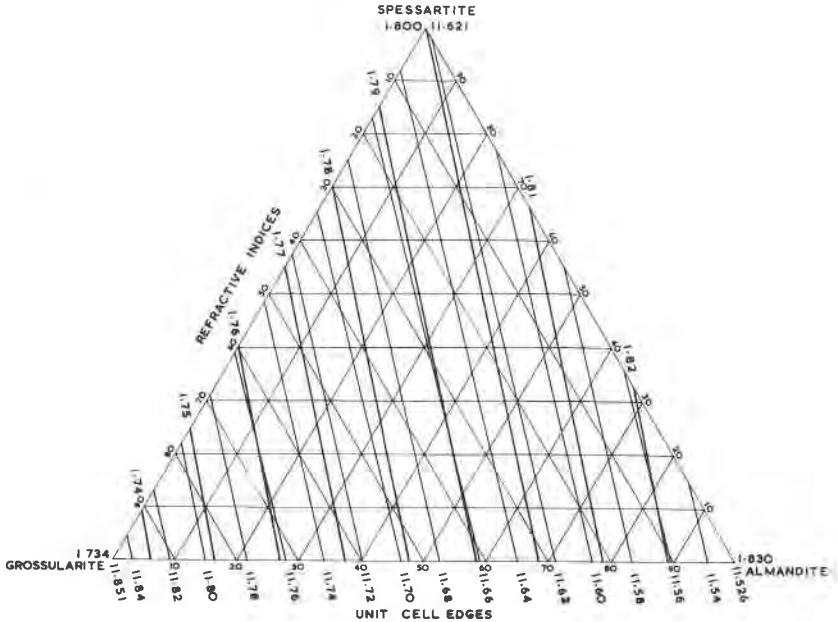

FIG. 3. Spessartite-grossularite-almandite.

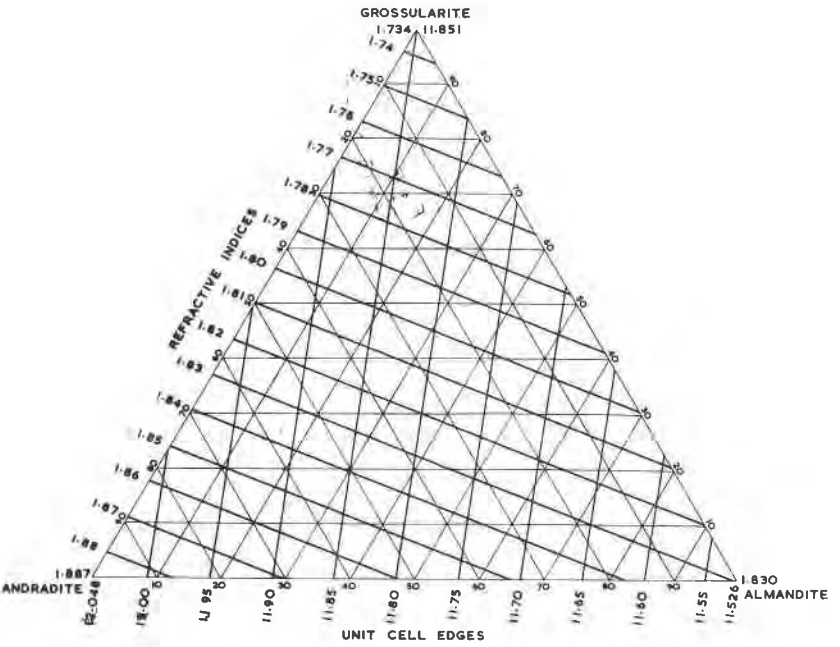

FIG. 4. Grossularite-andradite-almandite.

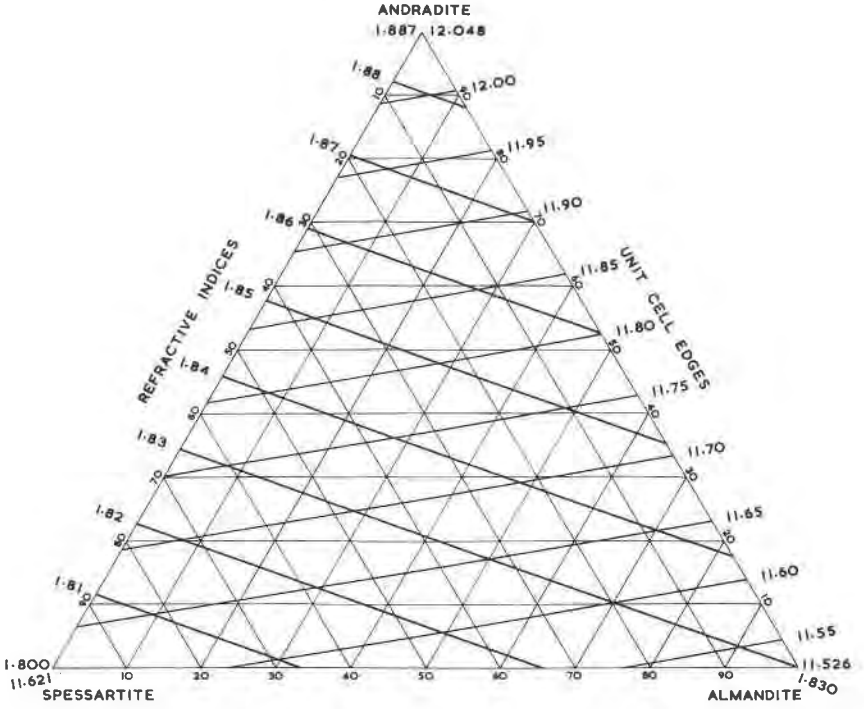

FIG. 5. Andradite-spessartite-almandite.

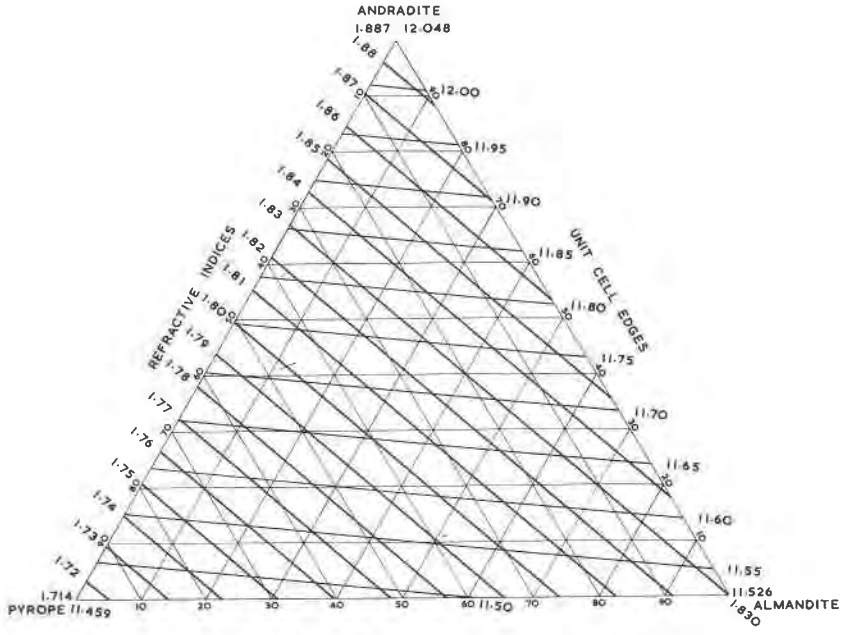

FIG. 6. Andradite-pyrope-almandite.

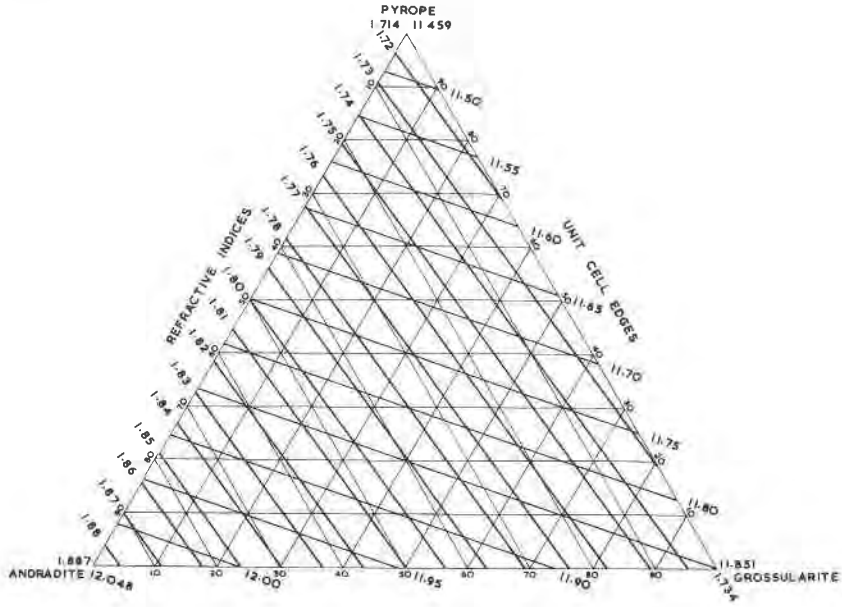

FIG. 7. Pyrope-andradite-grossularite.

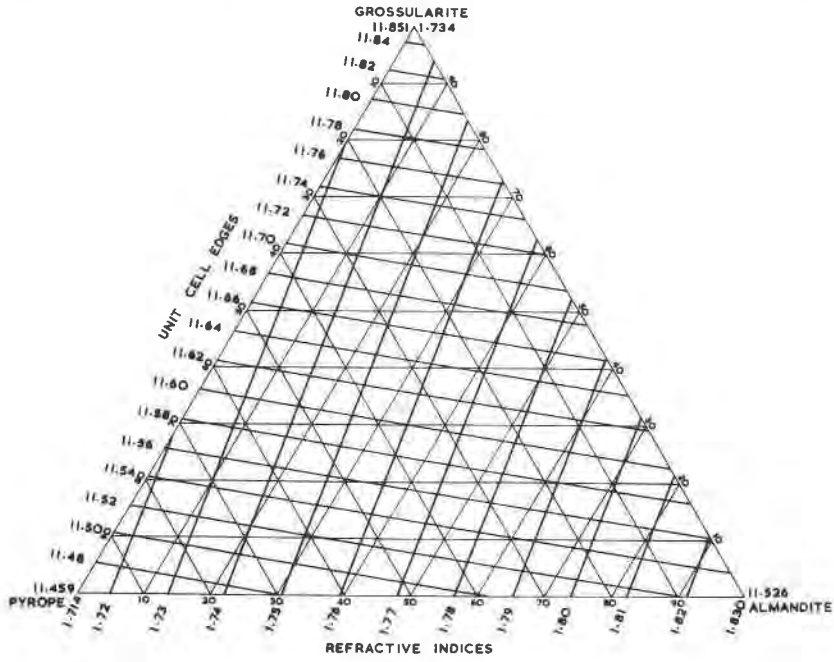

FIG. 8. Grossularite-pyrope-almandite.