Structure refinement of Ca2NaCd2V3O12 and crystal chemistry of palenzonite garnets.

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Single crystals of vanadate garnet Ca2NaCd2V3O12 were synthesized by a floating zone method, and its crystal structure was investigated using single-crystal X-ray diffraction. The structure is subjected to the geometric constrains similar to that of silicate garnets. The geometric constraints force the tetrahedral-dodecahedral shared edge to become shorter than the unshared tetrahedral edge. The other palenzonite garnets have unusual structure features, which like grossular-type garnets (the dodecahedral-dodecahedral shared edge length is longer than the unshared dodecahedral edge length and the octahedral-dodecahedral shared edge length is as long as the unshared octahedral edge length). On the other hand, Ca2NaCd2V3O12 garnet has a normal structure feature, which like pyrope-type garnets, in that dodecahedral-dodecahedral share egde length is shorter than the unshared dodecahedral edge length.