The crystal structures of these compounds were reported (Titov et al., 2009) in Immm, based on 
laboratory X-ray powder diffraction data. Our laboratory data indicated that the symmetry was 
lower, so we collected synchrotron powder data at beam line 11-BM at the Advanced Photon Source 
at Argonne National Laboratory, to characterize the distortions from the reported structure.

These compounds crystallize in Pnma, with lattice parameters in the ranges: 5.722 < a < 5.724, 
19.995 < b < 20.317, 5.708 < c < 5.770 Å, and 655.661 < V < 671.502 Å³. Although the lattice 
parameters increase with the size of the lanthanide cation, the increase is not linear. Although the 
metal atoms have a high-symmetry arrangement, the oxygen polyhedra are distorted and tilted from 
the arrangement originally reported. The Sc sites are 6-coordinate (octahedral), and are occupied 
only by Sc. The R sites are 7-coordinate (considering R-O distances < 3.0 Å), except for Gd, which 
is 6-coordinate. For the larger lanthanides, both the Sr and R sites exhibit partial occupancy by the 
other large cation. As the lanthanide gets smaller, the site occupancies become closer to 
stoichiometric; in SrGd₂Sc₂O₇, the site occupancies are all unity. The anisotropic strain broadening 
is more complex than can be described using the normal tensor model; conclusions about the 
microstructure will be discussed. A density-functional geometry optimization of the Gd compound 
yielded excellent agreement with the refined structure, and provides insight into the bonding in these 
compounds.

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