

coordination between TbFeO_3 and NdFeO_3 . At the extremities of the series this approximation breaks down. For LuFeO_3 the seventh and eighth nearest oxygen atoms are becoming second nearest neighbors, while for LaFeO_3 the ninth nearest oxygen is too close to be considered a next nearest-neighbor. This change in coordination number governs the behavior of the b parameter.

It seems likely that a similar mechanism applies in the case of the REAlO_3 series. However, it is important to note that the orthorhombic series begins with SmAlO_3 where the coordination number of Sm^{3+} is very nearly twelve, compared to eight for its iron counterpart. Also, the non-linear variation of the c parameter and the significant change in slope of the b parameter between Sm and Tb in Fig. 1 suggest a rapid decrease in the coordination numbers of the rare earth ions. Between DyAlO_3 and LuAlO_3 the coordination number does not appear to decrease as drastically. However, without a detailed knowledge of the structure of at least several more REAlO_3 members, it is difficult to ascertain how the rare earth polyhedron varies across the series.

Another interesting point is that starting with Ho one needs high pressures to synthesize single phase rare earth orthoaluminates. LuAlO_3 was easily formed at 32 kbar but no attempt was made to find the minimum pressure necessary for this synthesis. We suspect that 32 kbar exceeds the minimum considerably. It is a logical step to attempt to synthesize under pressure MAlO_3 , where M is of smaller ionic radius than Lu^{3+} . We believe In^{3+} and possibly Sc^{3+} are likely M-cations and expect to proceed with these experiments in the near future.

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