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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