of Bond's method (8, 9). The powder patterns for Eu-$LuAlO_3$ are listed in Table 2.

Discussion

The lattice parameters of $SmAlO_3$-$LuAlO_3$ are plotted against atomic number in Fig. 1. Atomic numbers rather than ionic radii were chosen as abscissae since the variation in coordination number across the series is not known. One can see that while the a and c parameters decrease in a nearly linear fashion from Sm-Lu, b increases asymptotically to the Lu value. The behavior of the b parameter resembles that of $REGaO_3$ (10) compounds between Ce and Gd and the b parameter of the $REFeO_3$ series between La and Gd (11). However, in the case of the two latter series, the b values eventually decrease for smaller rare earth ions, but no decrease occurs for the $REAlO_3$ compounds.

The entire series of $REFeO_3$ structures have been refined from single crystal data in order to fully understand the mechanism underlying this anomalous behavior (4). It is now clear that the oxygen polyhedron around the rare earth ion is distorted and this distortion varies drastically across the series. The rare earth ion has approximately an eight fold

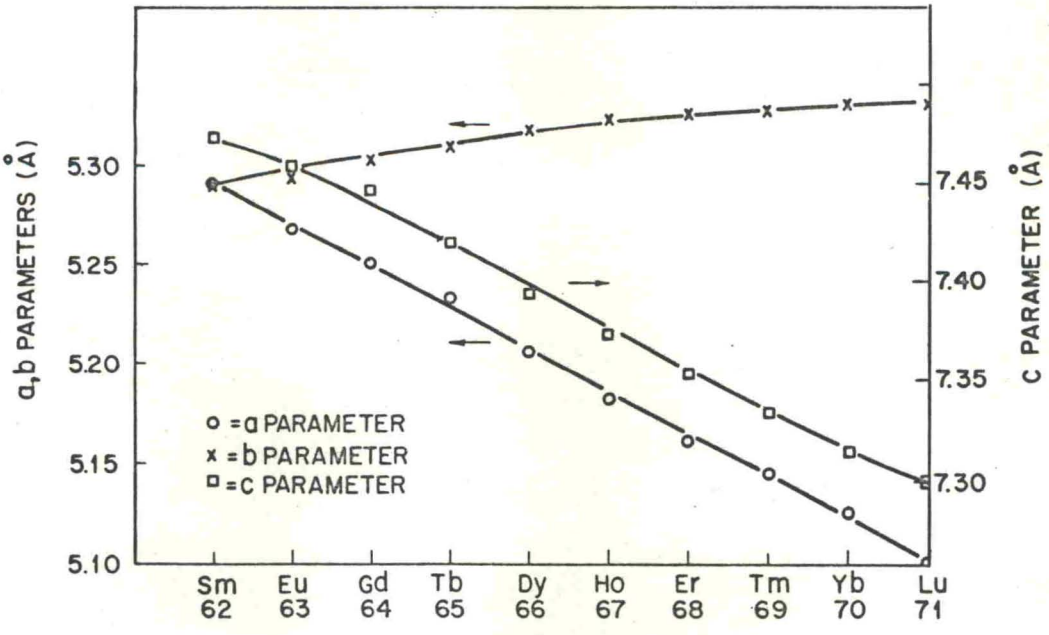

FIG. 1

Lattice parameters a, b, and c versus atomic number for the rare earth orthoaluminates.