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HIGH PRESSURE SYNTHESIS AND CRYSTAL DATA  
OF THE RARE EARTH ORTHOALUMINATES

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ABSTRACT

Single crystals of the rare earth orthoaluminates,  $REAlO_3$ , with  $RE = Dy - Lu$ , have been synthesized at high pressure in the presence of a flux. Lattice parameters for the orthorhombic members of the series, Sm-Lu, are reported. The  $a$  and  $c$  lattice parameters decrease smoothly in the direction Sm to Lu but the  $b$  parameter increases asymptotically to a maximum value at Lu. The anomalous behavior of the  $b$  parameter is similar to the variation of this parameter in the isostructural  $REFeO_3$  series between La and Gd. For these latter compounds the variation has been explained in terms of a gradual change in the coordination number of the rare earth cation. A similar mechanism appears to be the cause in the case of the rare earth orthoaluminates.

Introduction

Unlike the  $ABO_3$  perovskite-like compounds where  $A$  = rare earth and  $B = Fe, Ga, V, Cr, Rh, Sc$  and  $In$ , the rare earth orthoaluminates are not isostructural across the entire series. From La through Nd the orthoaluminates have a trigonal distortion of the ideal perovskite structure whereas from Sm through Lu they have the orthorhombic distortion found in the rare earth orthoferrites. The series is also unusual in that the synthesis of the members  $Dy-TmAlO_3$  at atmospheric pressure generally yields a mixture of phases, namely the rare earth orthoaluminate plus the rare earth aluminum garnet(1). More