The Preparation and Nonstoichiometry of Samarium Hexaboride

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Koichi NIIHARA

The Research Institute for Iron, Steel and Other Metals

Abstract

Samarium hexaboride was prepared by the borothermal reaction; $2\ Sm_2O_3+(6+4x)B=4SmB_x+3\ B_2O_2$. The residual oxygen content amounted to less than 0.03 w/o under optimum reaction conditions heating at 1650°C for 2 hr under a high vacuum. It was found by X-ray intensity and density measurements that the samarium hexaboride stayed stable over a large nonstoichiometric region from $Sm_{0.68}B_6$ to SmB_6. These extensive nonstoichiometric properties of samarium hexaboride can be explained in terms of the required electron numbers of the SmB_6 network in hexaboride.

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