

Water vapor effect on high-temperature oxidation behavior of Fe₃Al intermetallics

Sebastian Chevalier *et al* 2009 *Sci. Technol. Adv. Mater.* **10** 045006 (7pp) doi: [10.1088/1468-6996/10/4/045006](https://doi.org/10.1088/1468-6996/10/4/045006) [Help](#)

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Abstract. Fe₃Al intermetallics (Fe₃Al, Fe₃Al-Zr, Fe₃Al-Zr,Mo and Fe₃Al-Zr,Mo,Nb) were oxidized at 950 °C in dry and humid (11 vol% water) synthetic air. Thermogravimetric measurements showed that the oxidation rates of the tested intermetallics were lower in humid air than in dry air (especially for Fe₃Al-Zr,Mo and Fe₃Al-Zr,Mo,Nb). The addition of small amounts of Zr, Mo or Nb improved the kinetics compared with that of the undoped Fe₃Al. Fe₃Al showed massive spallation, whereas Fe₃Al-Zr, Fe₃Al-Zr,Mo and Fe₃Al-Zr,Mo,Nb produced a flat, adherent oxide layer. The rapid transformation of transient alumina into alpha alumina may explain the decrease in the oxidation rate in humid air.

Keywords: intermetallic compounds, iron aluminides, water vapor, oxidation, transient alumina phases

Print publication: Issue 4 (August 2009)

Received 21 April 2009, accepted for publication 1 August 2009

Published 12 October 2009

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