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Authors: Lin Yuan, Wenchao Shi, Rajiv Shivpuri, Fuchang Xu, Debin Shan

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Increased hot forgeability of 2024Al/$Al_{18}B_4O_{33}$w whisker composites at high strain rates

Lin Yuan[a, b, *], Wenchao Shi[a, b], Rajiv Shivpuri[c, *], Fuchang Xu[a, b], Debin Shan[a, b]

[a] School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, Heilongjiang, China

[b] National Key Laboratory for Precision Hot Processing of Metals, Harbin 150001, Heilongjiang, China

[c] Department of Integrated Systems Engineering, The Ohio State University, Columbus, OH 43210, USA

*Corresponding author. Tel:/fax: +86 451 86416221.

E-mail addresses: yuanlin@hit.edu.cn (Lin Yuan), shivpuri.1@osu.edu (Rajiv Shivpuri)

Post address: P.O. Box 435, No.92 West Dazhi Street, Harbin 150001, Heilongjiang, PR China.

Abstract

Whisker reinforced aluminum alloy composites are attractive for structural applications in automotive and aerospace applications. However, their forgeability is limited by their poor ductility at room temperature. The effects of temperatures (350 - 520°C) and strain rates (0.01 - 50s^{-1}) on the resistance to microcracking and on the closure of voids are investigated for 2024Al/$Al_{18}B_4O_{33}$w whisker composite as well as unreinforced AA2024 alloy. Under elevated temperature and high strain rate (>450°C, >1.0s^{-1}), there are less cracks and no axial splitting on the surface of 2024Al/$Al_{18}B_4O_{33}$w composite. Test results show lower flow stresses and incipient melting at higher temperatures enable better tolerance of whisker-matrix strain