

IOP ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

This content was downloaded from IP address 178 237 48 21 on 20/07/2019 at 09:29

IOP Publishing

Mater. Res. Express 6 (2019) 096581

https://doi.org/10.1088/2053-1591/ab2d93

Materials Research Express



PAPER

On the mechanical behavior of accumulative roll bonded lightweight composite

neceived 12 March 2019

REVISED 3 June 2019

ACCEPTED FOR PUBLICATION

27 June 2019

PUBLISHED 17 July 2019 Dhyai Hassan Jawad^{1,2}, Ali Hosseinzadeh¹ and Guney Guven Yapici¹

- 1 Mechanical Engineering Department, Ozyegin University, Istanbul, Turkey
- Faculty of Mechanical Engineering, Babylon University, Babel, Iraq

E-mail: guven.yapici@ozyegin.edu.tr

Keywords: layered composite, accumulative roll bonding, aluminum, severe plastic deformation, cyclic strength, fatigue properties

Abstract

Multi-layered composites have received great interest due to their enhanced mechanical and physical properties. In this study, Al6061/Al2024 composites were processed by accumulative roll bonding as a severe plastic deformation technique. The processed structure after four cycles contained alternating layers of both aluminum compositions. For outlining the mechanical behavior, uniaxial deformation experiments in the monotonic and cyclic regime were performed. With increased number of processing cycles, decent progress in hardness levels was exhibited with varying degrees among constituent alloys. Accordingly, improvement levels of up to 1.5 and 2 times were recorded for Al2024 and Al6061 layers, respectively. The tensile strength of the bi-metallic composite reached over 320 MPa after two cycles, coinciding with more than two-fold of the weaker base composition. Fatigue strength was also improved, especially at the low cycle regime. Microstructural observations revealed