Journal of King Saud University – Engineering Sciences (2017) 29, 269–277

King Saud University

Journal of King Saud University – Engineering Sciences

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

Study of tensile properties, fractography and morphology of aluminium (1xxx)/coconut shell micro particle composites

Sefiu Adekunle Bello [a,*], Isiaka Ayobi Raheem [b], Nasir Kolawole Raji [c]

[a] Department of Materials Science and Engineering, College of Engineering and Technology, Kwara State University, Malete, Nigeria
[b] Department of Metallurgical and Materials Engineering, Faculty of Engineering, University of Lagos, Lagos, Nigeria
[c] Department of Metallurgical Engineering, Federal Polytechnic Yaba, Lagos, Nigeria

Received 6 May 2015; accepted 6 October 2015
Available online 19 October 2015

KEYWORDS

Fractography;
Aluminium (1xxx);
Tensile property;
Enhancement;
Ductility;
Coconut shell

Abstract Aluminium (1xxx)/coconut shell micro particle (Al/CMP) composites have been developed using a compo cast technique. Coconut shells (CSs) were processed with the aid of mortar/pestle and disc grinder and then classified with a set of sieves vibrated with a sine shaker. The CMP additions increased from 2% to 10% at 2% interval. Microstructural/chemical composition analyses were carried out with the aid of scanning electron microscopes (ASPEX 3020) with attached energy dispersive X-ray spectroscopy. Phases were identified using an X-ray diffractometer (XRD). The tensile properties and mode of fracture were studied using Instron extensometer and Avery Denison Impact Testing Machine respectively. Results revealed 99.3% purity of aluminium matrix. The presence of new phases in the aluminium matrix is attributable to chemical interaction between Al and CMPs. The fine grained structure of Al/CMPs composites was confirmed by SEM and optical micrographs. The enhancement in the tensile properties is attributable to the presence of hard phases in the Al matrix and good interfacing bonding between Al matrix and CMP reinforcements. The cone and cup surface appearance with fibrous, dull, dimple and goose grain microstructure of the fracture surfaces of the composites is an indication of ductile fracture. Hence low cost metal matrix aluminium based composites have been developed.

1. Introduction

Metal matrix composites are characterised with high specific mechanical properties such as high strength and ductility per unit volume. Their demands in structural applications for replacement of heavy legacy alloys are now gaining global acceptance. Among non-ferrous metals aluminium attains dominance because of its inherently excellent properties which

* Corresponding author.
Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jksues.2015.10.001
1018-3639

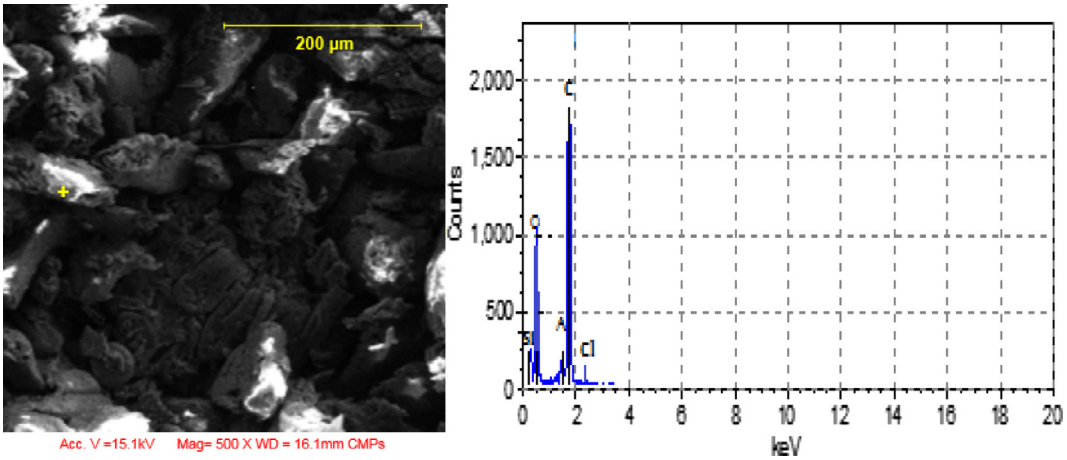

Plate 1 SEM/EDS of the bulk CS.

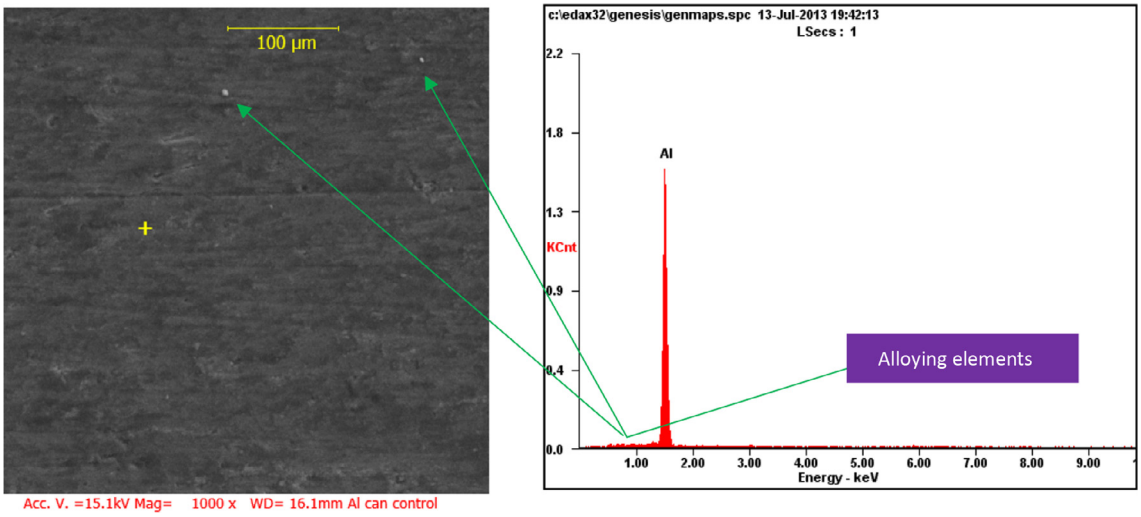

Plate 2 SEM/EDS of the control Al sample.

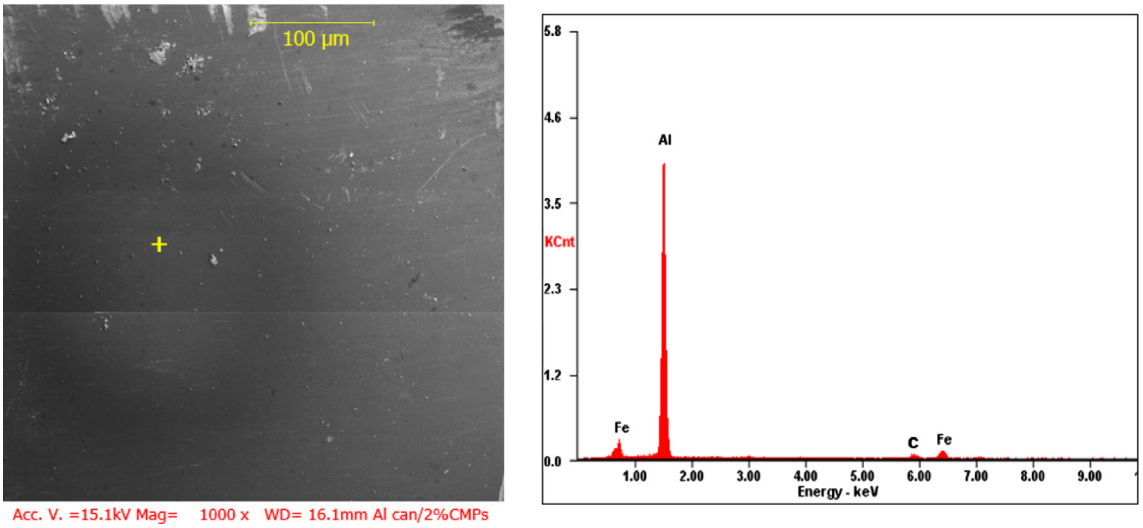

Plate 3 SEM/EDS of the Al/2%CMP composite.