Abstract

Aluminium and its alloys are diversely used in automotive sectors, aircraft, food, and marine industries due to its high strength to weight ratio. Additionally, aluminium based Metal Matrix Surface Composites (MMSC) gained popularity by exhibiting improved corrosion and wear resistance as well as excellent fatigue strength. Microorganisms can affect these surfaces by forming biofilms, deteriorating the life of components, and creating several health issues. In the present study, an attempt is made to fabricate MMSC via Friction Stir Processing (FSP) route. The silver nanoparticles (AgNPs) are used as antimicrobial agent and incorporated in the aluminium 1050 matrix to make the surface antibacterial. The presence of AgNPs within the aluminium matrix is analyzed by Scanning Electron Microscopy (SEM). The surface wettability and roughness also studied. Additionally, an antibacterial test is performed against *E. coli* on the surfaces. Also, ZnO nanoparticles (ZnO NPs) reinforced surface composite fabricated for the comparative antibacterial study. It is observed that AgNPs are distributed in the needle-like shape structure in the aluminium matrix on the retreating side. However, on the advancing side, nanoparticles are distributed in the grain boundaries. The surfaces are hydrophilic in nature, and surface roughness varies from micrometer to several nanometers. A slight improvement in the antibacterial activity is observed in the AgNPs induced surface composite.

Keywords Metal Matrix Surface Composite, Friction Stir processing, AgNPs, Antimicrobial agent, ZnO NPs