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CONGRESS ID

CONGRESS TITLE

7. INTERNATIONAL MARMARA SCIENTIFIC RESEARCH AND INNOVATION

CONGRESS

DATE AND PLACE

27-28 JANUARY 2024, ISTANBUL/TURKEY ONLINE PRESENTATIONS

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ISBN: '978-625-367-648-3'

MECHANICAL PROPERTIES OF TITANIUM MATRIX COMPOSITES REINFORCED WITH NANO AND MICRO-SIZED Al_2O_3 PARTICLES

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ABSTRACT

Titanium matrix composites (TMC) are used in the automotive, aerospace and defence industries thanks to their exceptional strength, high fatigue strength, good corrosion resistance and high elastic modulus. Some of the most used reinforcement materials for TMCs are SiC, Zr_2O_3, Al_2O_3, TiO_2, graphene, and TiC. In this study, TMCs reinforced Aluminum Oxide (nano and micro-sized Al_2O_3) were produced via the ultrasonic-assisted mixing powder metallurgy method. Al_2O_3 in varying amounts (1, 3 and 5 wt.%) was incorporated into the TMCs via mechanical alloying (MA) for five hours in a high-energy ball mill and using ethanol as a process control agent. The mechanically alloyed powders were compacted by a hydraulic press under uniaxial pressure of 450 MPa and sintered at 1200^{o}C for 2 hours in an argon atmosphere. Properties of the Ti-xAl_2O_3 composites were examined via X-ray Diffraction (XRD), Optical Microscopy (OM), Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectroscopy (EDX), dimensional measurement, Archimedes method and microhardness and wear tests. The optimum amount of Al_2O_3 was determined according to the data obtained.

Keywords: Titanium, titanium matrix composites, Al_2O_3, nano-Al_2O_3, powder metallurgy.

*As project FDK-2021-4590, this study was supported by the YTU SRP Coordination Unit. We would like to thank the YTU SRP Coordination Unit for their support.

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