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J. Moradgholi, A. Monshi, K. Farmanesh, M.R. Toroghinejad, M.R. Loghman-Estarki



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Comparison of microstructure, toughness, mechanical properties and work hardening of titanium/TiO₂ and titanium/SiC composites manufactured by accumulative roll bonding (ARB) process

J.Moradgholi^{a*}, A.Monshi^a, K.Farmanesh^b, M.R. Toroghinejad^a, M.R. Loghman-Estarki^{b*}

^aDepartment of Materials Engineering, Isfahan University of Technology, Isfahan 84156-83111, Iran

^bDepartment of Materials Engineering, Malek Ashtar University of Technology, P.O. Box 83145/115, Shahin Shahr, Isfahan, Iran

j.moradgholi@ma.iut.ac.ir

mr.loghman@ma.iut.ac.ir

Abstract

In this study, the effects of TiO₂ ceramic nanoparticles and SiC microparticles on the microstructure, mechanical properties and toughness of titanium/TiO₂ nanocomposite and titanium/SiC composite were investigated. To achieve this goal, TiO₂ and SiC ceramic particles were incorporated as the reinforcement in titanium through the ARB (accumulative roll bonding) process. By adding SiC ceramic particles, the mechanical properties of the composite and the nanocomposite were enhanced, while their toughness was decreased, as compared to TiO₂ nanoparticles. After applying 8 cycles of the ARB process, UTS in Ti/5 vol% SiC composite reached to about 1200 (MPa), as compared to that in Ti/0.5 wt% TiO₂ nanocomposite, which was about 1100 (MPa). Furthermore, toughness in the Ti/5 vol.% SiC composite and the Ti/0.5 wt.%

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