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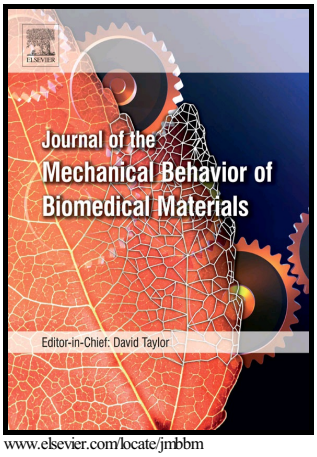

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Prediction of Cyclic Delamination Lives of Plasma-Sprayed Hydroxyapatite coating on Ti-6Al-4V substrates with considering wear and dissolutions

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Abstract

This study aims at developing the prediction model of cyclic delamination lives of plasma-sprayed HAp coating on Ti-6Al-4V substrate by considering wear by interface contacts and dissolution effect by Simulated Body Fluid (SBF). Plasma-sprayed hydroxyapatite (HAp) coating on Ti-6Al-4V substrates has been used as the load-bearing components of medical implants since it can provide both biocompatibility from HAp and high strength from Ti-6Al-4V substrate. However, delamination of HAp coating can lead to loosening of implants stem and final failure *in vivo*. In the fracture mechanism of interfaces between HAp coating with Ti substrates, only adhesive strength (interracial tensile strength) or fatigue behavior by longitudinal cracking have been observed. Cyclic delamination mechanism by considering various loading modes and corrosion effect has not been revealed yet. The interface delamination rates by cyclic loading were much higher than those by static loading tests. The result clearly demonstrated that the interface demalination behaviors are dominated not by maximum stress, but by stress range. Surface profile measurement and SEM observation also demonstrated damages by interface contact or third body wear at delamination tips of HAp coating only in the cases of compressions. The mechanisms of acceleration on the delaminations are third-body wear or wedge effect by worn particles which increased mean stress level during cyclic loading. Cyclic loading tests under SBF also revealed

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