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# Statistical Modeling of Microstructural Effects on Fatigue Behavior of α/β Titanium Alloys

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## Abstract

This paper presents the results of combined experimental and theoretical studies of the effects of colony microstructure on fatigue crack growth in Ti-6Al-4V. Colony microstructures with controlled lath widths and colony sizes are produced by controlled cooling from the β phase field. For colony microstructures with approximately 20 vol% of β phase, the fatigue crack growth rates are shown to decrease with increasing α lath and colony size. A new statistical multiparameter modeling methodology framework is proposed for the assessment of the combined effects of mechanical and microstructural random variables on the fatigue crack growth rate. Excellent statistical correlation has been observed between the theoretical model and experimental data. The implications of the results are also discussed for the estimation of fatigue life.