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Role of Ultrasonic Shot Peening on Low Cycle Fatigue Behavior of 7075 Aluminium Alloy

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Abstract

Ultrasonic Shot Peening (USSP) is a novel process of refinement of surface grain to nanoscale and inducing compressive residual stress in surface region of metallic materials. The effect of USSP is studied on microstructure and low cycle fatigue (LCF) behavior of peak aged 7075 aluminium alloy, in the present investigation. The microstructure in surface region of the USSPed specimens is found nanostructured. Phase stability, crystallite size, and lattice strain resulting from USSP are analyzed by X-ray diffraction (XRD). The effect of surface roughness and the compressive residual stress induced by USSP is examined on LCF behavior of the material. Enhancement in LCF life is observed by USSP treatment up to the duration of 180 seconds, however, fatigue life is reduced from longer duration of USSP for 300 seconds. The enhancement in LCF life is from combined effects of the surface nanostructure and the associated compressive residual stresses.

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