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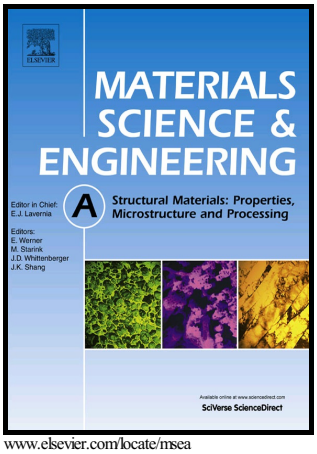

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Abstract

The fatique failure behavior of A390 hypereutectic aluminum alloy plate was studied with laboratory CT and such technique provided a new method for analyses of the mechanical failure. Results were based on the reconstructed fractography and SEM observation and special attention was paid to crack propagation mechanism in the hypereutectic alloy. The fatique crack surface was separated into crack initiation site around pores, flat crack propagation zone and instantaneous crack zone. While the flat crack propagation zone only occurred in high cycle fatique and the height fluctuation of flat propagation was within 50 μm. The disappearance of flat propagation in low cycle fatique showed the different crack propagation mechanism between hypereutectic and hypoeutectic alloy. Different crack propagation stage changed with the stress intensity of crack tip. The flat propagation zones for high cycle fatique attributed to the relatively parallel extension of crack and debonding between PSPs and matrix in hypereutectic alloy. While under higher stress intensity like the case in LCF or later stage of HCF, the crack branched and extended instantaneously, tortuous crack propagation route formed and many PSPs with minor cracks or striations remained.