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## Failure behavior of high pressure die casting AZ91D magnesium alloy

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**Abstract**

The failure behavior of high pressure die casting AZ91D magnesium alloy during both tensile and fatigue tests was studied in situ by using scanning electron microscope. Attention was focused on the role of microstructure played in crack initiation and propagation. Results showed that the defects in castings, including gas pore, shrinkage pore and defect band, were the crack initiation sources. In tensile test, the crack propagated in a combination of intergranular and transgranular modes, and the specimen fractured by connecting defects at the section with minimum effective force bearing area. In fatigue test, the crack propagated in a transgranular mode at specific crystalline planes. When the crack was in contact with the  $\beta$ -phase, the crack would pass through, and fracture the network  $\beta$ -phase, whereas bypass the island  $\beta$ -phase by detaching it from the surrounding  $\alpha$ -Mg grains. Besides, defects in front of the crack would act as the secondary crack initiation sources, from which new cracks would initiate and propagate. With the propagation of the fatigue crack, the actual maximum cyclic

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