

On the variability in static and cyclic mechanical properties of extruded 7075-T6 aluminum alloy

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Abstract

The present paper investigates the variability in the static and cyclic properties of two nominally identical supplies of the aeronautical Al grade 7075-T6. Samples were extracted from extruded bars of 15 mm and 60 mm diameter and with slightly different chemical composition. Noticeable differences were found in tensile strength, total elongation, low- and high-cycle fatigue strength, despite the nearly identical hardness value. The diverse mechanical behavior has been imputed to different extrusion ratio and therefore work hardening along with a more or less fine distribution of precipitates and dispersoids. The high-cycle fatigue strength was found to be in direct correlation with the monotonic yield strength and the size of the largest intermetallic precipitate. A simple equation based on Murakami sqrt(area) parameter is proposed to predict the fatigue endurance. Tensile tests and microstructural analyses are recommended instead of conventional hardness tests to have a tighter quality control on the mechanical properties of semifinished products.

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