



Age-hardening of the aluminium alloy EN 4017

by D.B. Swanepoel* and W.E. Stumpf*

Paper written on project work carried out in partial fulfilment of B.Eng. (Metallurgy) degree

The presentation made by D.B. Swanepoel won the prize for the best presentation from both a technical and presentation perspective at the SAIMM Student Colloquium held in October, 2008. Both authors, however, have requested that the paper be referred. The full paper will be published in a future edition of the *Journal* once the refereeing process has been completed.

Synopsis

Hulamin Rolled Products (Ltd) developed a high Mn and Si containing alloy, EN 4017, as a scrap consuming alloy from the waste generated in producing their range of clad products for brazing of inter alia automotive heat exchangers. The multifaceted composition of this alloy (Al—1.2% Si—1.1% Mn -0.2% Mg—0.26% Cu) suggested that it might display some degree of strengthening via precipitate formation of the Mg₂Si-types. The ageing isotherms constructed showed that EN 4017 with 0.19% Mg reached a lower peak strength (YS~210 MPa and UTS~260 MPa) compared to the EN 4017 material with 0.43% Mg (YS~270 MPa and UTS~325 MPa). The higher Mg variant of EN 4017 was comparable with the age-hardenable reference alloy EN 6061. Selected area electron diffraction (SAED) studies proved that the microstructure of age hardened EN 4017 contained a combination of β', β'' and U₂-phase after being aged at 175°C for 65 h. The general microstructure contained precipitate free zones as well as grain boundary Si films, although these did not lead to significant embrittlement. The role of Mn dispersoids in the fracture mechanism of 4017 is also discussed. The article will continually compare the behaviour of EN 4017 with that of EN 6061.

Keywords: age-hardening, dispersoids, magnesium silicide, precipitate free zones.

* Department of Materials Science and Metallurgical Engineering, University of Pretoria, South Africa.

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