

The Influence of High Temperature Loading on the Structure of Fine Al Powder Compacts

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Aluminum specimens for pilot resistance testing at higher temperature and mechanical loading were prepared by means of powder metallurgy. The aluminum powders with nanooxide surface layers were prepared. The tests were performed at 300°C and applied stress of 100, 125, 150, 175 MPa and at temperatures 350°C and 400°C and stress of 100 MPa. Aluminum specimens tested at 300°C and stresses of 100 and 125 MPa were characterized by very high resistance. Similar resistance was exhibited by specimens tested at 350°C and 100 MPa. The rupture of specimens tested at 350°C at 150 and 175 MPa was initiated mainly from surface defects. By aluminum tests at temperatures below 400°C, compact oxide layer was not disturbed. Oxide layer fragmentation at 400°C resulted in lower resistance of aluminum specimens. The resistance increase was accompanied by higher portion of ductile fracture with dimpled morphology. Large angle grains size was not changed. Higher temperatures and stresses cause dislocation netting on grain boundaries and initiate subgrains formation.

Keywords: aluminum powder, nanooxide layer, thermal resistance, dislocation netting

Acknowledgements

The contribution was prepared under the support of VEGA project - 1/0234/11.

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