

OP 095

Microstructural and mechanical characterizations of Mo-14Re alloy/AlN ceramic joints by Ni-Ti-Cr-Si-B composite braze

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Successful brazing of Mo-14Re alloy and AlN ceramic was achieved using a novel Ni-Ti-Cr-Si-B filler, for the first time. The typical microstructure of the joints was MoRe/ σ (Mo₂Re₃)/Ni(Mo,Cr)+Ni-Si+Cr-B/Ni(s,s)/TiN/AlN. During the brazing process, a certain amount of Si diffused into the base material as a melting-point-inhibiting element, and the active element Ti can spontaneously form a dense TiN layer on the surface of AlN ceramic. Through the formation of concentration gradient joints, the maximum shear strength of the joints reached 129.8 ± 7.8 MPa at room temperature and 77.96 ± 15.7 MPa at 1000°C (at 1150°C/15 min), respectively. The excellent mechanical performance was ascribed to (i) the solid solution strengthening by Mo dissolved and diffused and (ii) the effective stress relief of in-situ TiN phase. This method of obtaining high strength and heat resistance joining of MoRe/AlN expands applications in field of aerospace, nuclear energy and electronics.