Brazing of Tantalum with AISI 304 Using Copper Base Filler[1]

Fadhel A. Hashim[2] **Adnan N. Abood[3]**
Ali T. Abdul Hussain[4]

Abstract

The aim of this research is to study the ability of brazing austenitic stainless steel AISI 304L to pure tantalum (99.9%Ta) by using copper base non-active filler under inert gas protection. The specimens were inserted in special container (retort) with argon flow rate of 1 liter/min. in muffle furnace. Four types of filler metal alloys DIN L-Ag20Cd, AWS RBCuZn-C, AWS RBCuZn-D, and AWS BCu-1 were used with double-butt joint to study the effect of filler metal and brazing time on microstructure and shear strength. It was found that the four filler provided acceptable joining for similar and dissimilar specimens. From microstructure examination of the brazed joint, L-Ag20Cd form intermetallic compound at interface between the filler and base metal. Copper – rich dendrites in Ag-Cu-Zn-Cd eutectic matrix was showed. Increasing brazing time to 10 min. reduces growth of intermetallic compound and shear strength. Brazing using AWS RBCuZn-C showed the existence of two phases $\alpha - brass$ and $\beta - brass$ and intermetallic compound at interface. Brazing by AWS RBCuZn-D showed the best shear strength, of 75 MPa at brazing time 10 min for stainless steel to tantalum in comparison to the shear strength values for the other filler because it forms two bonding phases. The first was CrNi at interface between the filler and stainless steel and the second was NiTa at interface between the filler and tantalum. AWS BCu-1 filler showed the highest shear strength value 233 MPa for similar brazing of stainless steel at 10 min. due to the formation of reaction waves at interface that resulting from copper diffusion in the stainless steel.

[1] For the paper in Arabic see pages (85 -113).

[2]Asst. Prof. Mechanical Engineering Dep. Engineering College Al Nassria University Iraq.
[3]Asst. Prof. Welding Engineering Dep. Technical College. Baghdad Foundation of Technical Education Iraq.
[4] B.Sc. Engineering Oil Institute Ministry Of Oil Iraq.