

Columbium-Rhenium

Fig. 3 shows the bond formed between columbium and rhenium after 3 hrs. at 1600° C. and 10,000 psi. The columbium surface was prepared by etching in nitrichydrofluoric acid. The rhenium surface was cleaned by firing in dry hydrogen at 1100° C. Properties of the bond were strong but somewhat brittle which is attributed to the X-phase in this system.

Molybdenum-to-Molybdenum

Bonding of molybdenum to itself can be accomplished at 1450° C. and 10,000 psi for 3 hrs. High-strength bonds are achieved; however, some loss in room temperature-ductility occurs due to the recrystallization of the base material during bonding. Fig. 4 shows a typical bond between molybdenum surfaces which were etched in nitric acid.

Molybdenum-to-Titanium

Excellent quality bonds can be achieved between molybdenum and titanium as shown in Fig. 5. This specimen was bonded at 925° C. and 10,000 psi for 2 hrs. These bonds possess good mechanical properties. By using a very thin (< 1 micron) film of titanium on molybdenum surfaces, it is possible to join molybdenum to itself below its recrystallization temperature. This approach is quite useful in many diffusion-bonding applications where the temperature of processing must be limited for metallurgical reasons.

Molybdenum-to-Rhenium

Complete bonding of molybdenum to rhenium has been achieved by processing at 1600° C. and 10,000 psi for 3 hrs. Fig. 6 shows the interface

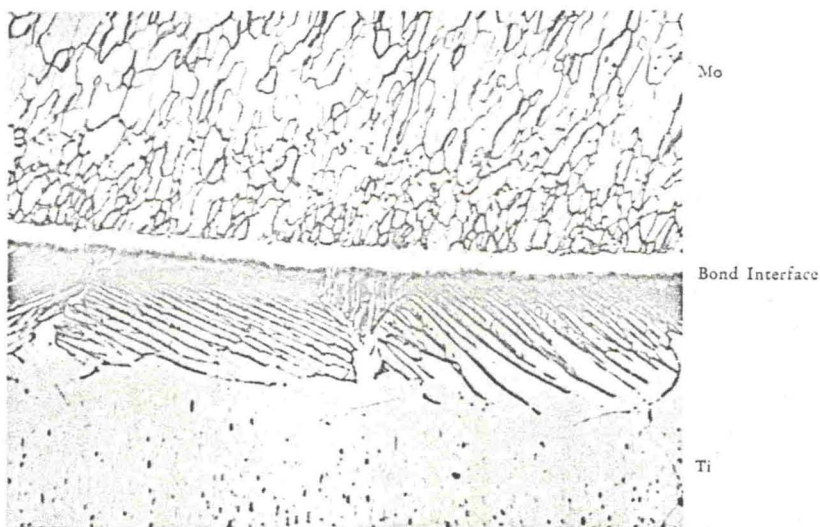


Fig. 5. Bond between molybdenum and titanium. $\times 500$.