The egg-crate design shown was made up from individual strips of pure tungsten. The flow channels were formed by placing molybdenum strips alternately with the tungsten pieces. The molybdenum served the same function as the mild steel in the previous example. The assembly is then canned in molybdenum, evacuated, and sealed. Gas-pressure bonding was conducted at 1600° C. and 10,000 psi for 3 hrs. Removal of the can and tooling was accomplished by leaching in nitric acid which does not attack tungsten. The result was a structure of high integrity which functions as a monolithic body at temperatures in excess of 2000° C.

Conclusions

Experimental studies at Battelle-Columbus have demonstrated the suitability of solid-phase bonding for applications involving refractory metals. The gas-pressure-bonding process is particularly useful because of the versatility of process due to the omnidirectional application of pressure by the gas. Control of process variables are readily achieved if the process is thoroughly understood in the material system in question. Properties of bonds between similar metals prepared in this manner will be equivalent to those of the base metals. However, in the case of dissimilar materials, attention must be paid to compound formation and Kirkendall effects which may limit the use of joint in high-temperature structural applications.

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