Cutting Ti/Nb Alloy to Specific Thickness

1.0: Purpose

Cutting and sectioning is a common practice in most materials laboratory. In many cases it is necessary to cut specimens to specific sizes for a variety of applications ranging from polishing, optical inspection, and materials testing. This report describes a process for cutting a 46% Titanium 54% Niobium alloy into a specific thickness of 0.010". Cutting parameters, blade type, and cutting times will be recorded.

2.0: Experiments and Procedures

A specimen of 46% Titanium 54% Niobium was mounted onto a 1" diameter mounting block using low melting point wax. The specimen was 0.5" diameter and 1" long. The mounted specimen was then placed into the Model 65014 Rotary Cutter of the Model 650 Low Speed Diamond Wheel Saw and setup for cutting. The following parameters were used:

Load:	100-300 grams
Wheel Speed:	250 rpm
Rotary Speed:	15 rpm
Wheel Type:	DWH 4122 (4" high concentration, medium diamond wheel; 0.012")

Cut 1

A planarizing cut was first performed to provide a reference surface from which the specific sized specimen was to be cut from and to help determine the proper parameters for cutting this material. This cut took approximately 2.5 hours to complete. The advantage that slow speed offers over traditional high speed cutting methods is the low damage and enhanced precision obtained with a slow speed saw.

Cut 2

This second cut was made to a specific thickness of 0.010". The blade width and kerf loss during cutting must be taken into account when making a precision cut such as this. Typically for most cutting wheels, the kerf loss will be about 0.002"; that is a thickness of 0.002" must be added to the thickness of the cutting blade to ensure the proper dimension is obtained. For obtaining the specific thickness required for this application, the thickness of the blade added to the kerf loss was used to first obtain the zero point for cutting. The desired specimen thickness was then advanced using the micrometer to obtain the desired thickness. Following this procedure, cutting operations were performed and the final specimen measured. Cutting time for this cut was 3.25 hours.

3.0: Results

Following the second cut, the specimen was removed and cleaned for measurement. The specimen was found to be in the following thickness range: 0.0105" – 0.011". This is very close to the ideal section thickness and is well within the tolerance required.

Although cutting times are long, there is the advantage of precision and accuracy, which is unsurpassed. This couple with the low damage section produced provides a distinct advantage over the other sawing techniques.

4.0: Conclusions

Cutting hard metals with high precision has been shown to be effective using the Low Speed Diamond Wheel Saw. By selecting proper cutting conditions a section of preset thickness can be obtained with relative ease.

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