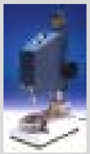


Cutting 8 mm Discs From Hard Disc Drives using Model 380 Ultrasonic Disc Cutter

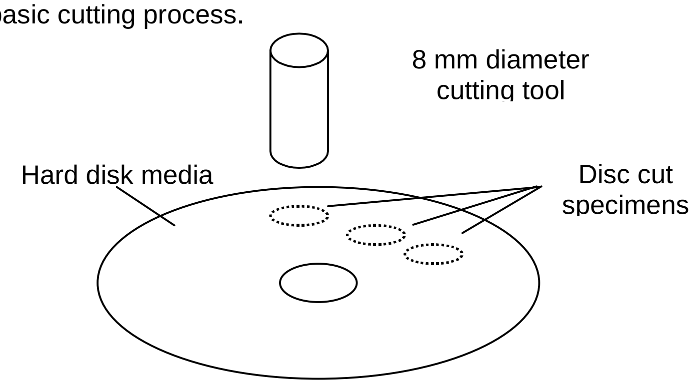
1.0: Purpose

Modern materials systems involve combinations of materials with varying materials properties, making the preparation of these materials somewhat challenging. This is especially true in the hard disk drive industry where current drive media consists of materials such as Co, Al, and glass. These materials all vary greatly in their behavior during cutting and create special problems when trying to prepare proper samples.

In this report cutting of two different types of hard disk drives will be investigated using the Model 380 Ultrasonic Disc Cutter. Discs of 8 mm diameter will be cut using the Model 380 and investigation of the cutting quality at the edge of the specimens will be done. Cutting quality and film / substrate interface quality will be evaluated based on different abrasive grits used during the cutting process.

2.0: Experiment

For this experiment two different 95 mm hard disk drive media were cut: a glass based hard disk and an Aluminum based hard disk. Both wafers were mounted to a metal plate using low melting point wax (MWH 135) prior to cutting. Below is a diagram of the basic cutting process.



Each wafer was cut using several different Boron Carbide abrasive grit sizes. Boron carbide is used because it is quite hard and does not break down as quickly as SiC, allowing good cutting action throughout the entire process. The time for cutting and the quality of the film / substrate interface was evaluated using a stereomicroscope. Following cutting the specimens were removed and cleaned in acetone.

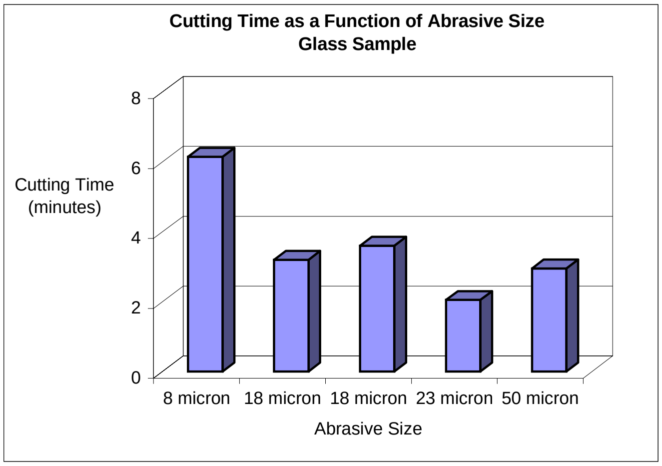
3.0: Results

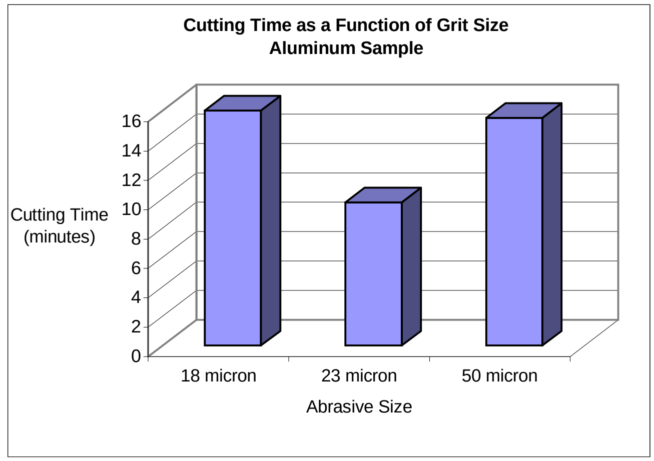
The following data was collected in regards to the cutting of the coated disk media. The cutting quality improved as the abrasive grit size was reduced based on the criteria of the film / substrate interface. At the coarse grit sizes the films began to delaminate and lift off from the substrate, preventing a good specimen from being produced. The best compromise between cutting time and specimen quality was around 23 microns.

Table 1: Results from Cutting Experiments

Sample	Particle Size (•)	Cutting Time (minutes)	Cutting Quality
Gl – 1	8 micron	6.15	Excellent film adhesion
Gl – 2	18 micron	3.2	Good film adhesion
Gl – 3	18 micron	3.6	Good film adhesion
Gl – 4	23 micron	2.05	Good film adhesion
Gl – 5	50 micron	2.95	Poor film adhesion
Al – 1	18 micron	16	Good film adhesion
Al – 3	23 micron	9.75	Good film adhesion
Al - 2	50 micron	15.5	Poor film adhesion

Shown below are charts of the data collected in Table 1. As can be seen, the best cutting times for both materials investigated were obtained using the 23 micron BC abrasive. The quality of the cuts improved with decreasing abrasive size, with the best results being obtained with the 8 micron size. However, the film / substrate interface showed only marginal quality improvement with the smaller abrasive grit sizes below 23 micron.





4.0: Conclusion

Based upon the experiments produced it has been shown that the best abrasive size for cutting these media materials is around 23 microns. This produces the best film / substrate interface quality with the best cutting times. Although slightly improved interface adhesion appears to be possible using smaller abrasive sizes, the improvement is minimal when compared with the cutting time. It has also been shown that both the Al and Glass disk media can be cut using the Model 380 with success, although the Al materials take longer to cut.

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