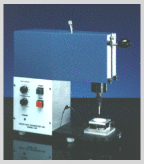

Cutting CdTe Detector Discs to Specific Diameter

1.0: Purpose

Cutting of most II-VI semiconductor materials poses difficult problems due to their brittle nature. Aggressive mechanical cutting methods are problematic due to high defect generation such as cleaving and crack propagation imparted to the specimen during the cutting process. Cadmium telluride (CdTe) is especially susceptible to these problems and must be cut using a gentle mechanical method. This report will describe a process used for sectioning small CdTe discs into specific diameters for use in detector applications. Cutting parameters such as abrasive type and size, tool load, cutting time, and specimen quality all will be evaluated to determine the best method for cutting these materials.

2.0: Experiments and Procedures

Several different specimens of CdTe discs were obtained for sectioning. Specimens of 16 mm and 10 mm diameter were used for the cutting process and were to be cut into a specific diameter using a Model 360 Abrasive Slurry Disc Cutter. A chart showing the various specimens for cutting along with an image of the discs is shown below.

Specimen #	Diameter (mm)	Desired Diameter (mm)
1	16	7.7
2	16	7.7
3	16	7.7
4	16	7.7
5	10	5.6
6	10	5.6
7	10	5.6
8	10	5.6

2.1: Specimen Mounting

Prior to sectioning with the Model 360, the specimens were mounted using three different techniques. Technique A mounted the specimen directly to the mounting plate using a low melting point wax (MWH 135). The specimen was then exposed to the tool and cut directly using an abrasive. Technique B mounted the specimen directly to the mounting plate (as with Technique A) but also used a retaining ring to hold the abrasive in place during cutting. Technique C used a glass cover slip over the top surface of the specimen to protect it during the cutting process. This entire specimen assembly was then mounted to a plate and used with a retaining ring as with Technique B. Below are schematic illustrations of the techniques.

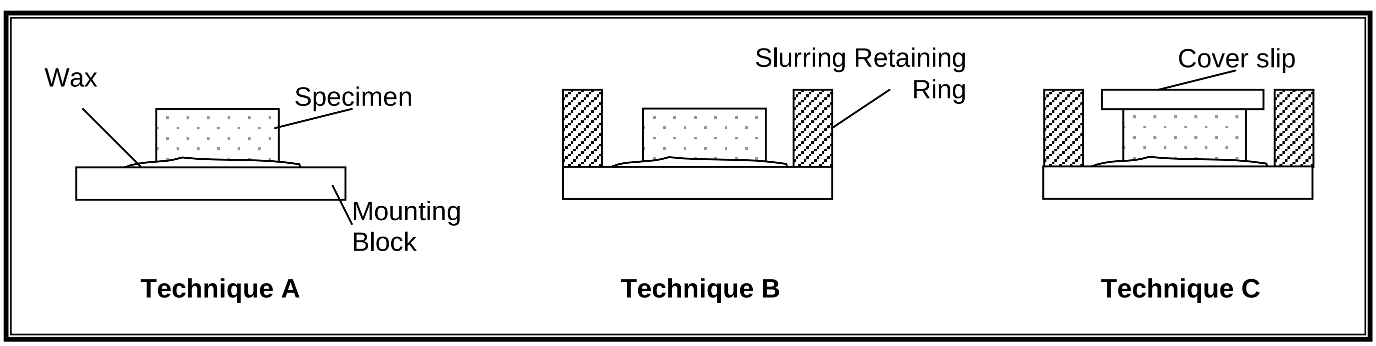

Figure 1: Illustration of the techniques used for mounting the specimens during the cutting process.

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2.2: Cutting Process

Following specimen mounting, each specimen was cut on the Model 360 Disc Cutter. Different size abrasives were used for the process, ranging from 50 micron down to 14 micron to evaluate the most efficient method. All cutting parameters were the same with the exception of the abrasive used and the tool diameter. The parameters used were: Load: ½; Tool Speed: 7 setting.

Each specimen cut is described below.

Specimen	Abrasive Used	Time	Result	Final Diameter
#8	14 micron BC premix	20 minutes	Used mounting technique A; Only cut ½ through; showed severe chipping at edges	Not measured
#1	35 micron BC premix	35 minutes	Used mounting technique B; Exhibited chipping at top surface	7.7 mm
#2	35 micron BC premix	30 minutes	Used mounting technique C; Very little chipping; edge quality good	7.65 mm
#3	23 micron BC powder	10 minutes	Used mounting technique C; No chipping; excellent edge quality	7.85 mm
#5	23 micron BC powder	15 minutes	Used mounting technique C; No chipping; excellent edge quality	5.85 mm
#6	23 micron BC powder	12 minutes	Used mounting technique C; No chipping; excellent edge quality	5.85 mm
#7	50 micron BC powder	5 minutes	Used mounting technique C; Severe damage; crystal destroyed	Sample Destroyed
#4	14 micron BC powder	18 minutes	Used mounting technique C; Very little chipping; good edge quality	7.85 mm

3.0: Results

From these cutting experiments it is clear that the specimens can easily be cut to the desired size using the Model 360. Mechanical damage caused by the cutting process is very low and can easily be prevented by using proper mounting techniques. Specimens of the desired size with very little edge chipping and damage are easily produced in a short amount of time.

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