Trizact™ Diamond Tile 677XA
Pad Conditioning Procedure

Technical Application Bulletin **September 2003**

General Information

Prior to first use, 3M™ Trizact™ Diamond Tile 677XA pads have a thin resin cap on the tile feature surface that must be removed to expose diamond grains and initiate cut. The method used to remove this resin cap depends on the substrate hardness and diamond grade of the pad. In this document, we will refer to the method of removing the resin cap as "breaking-in." The breaking-in step refers only to fresh, unused pads, and should not be confused with in-process conditioning. It is typical to remove approx. 10% of the abrasive feature height during the pad "break-in" step.

A discrete break-in step is not necessary for most medium hard glass substrates. Substrates with a Mohs hardness of 5–6 fall within this hardness class and include materials like boro-silicate, vitraeous silica and glass ceramic. These medium hard materials will satisfactorily condition a fresh Trizact Diamond Tile Pad "in process". When run at typical pressures of 1.5–3.0 psi and surface speeds of 400–600ft/min measured at the pad OD, materials in this class will remove the resin cap during the initial 5–15 minutes of the first batch. With the break-in accomplished, subsequent batches will not require the extra run time.

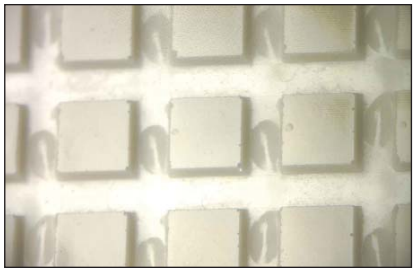
Periodic or in-process conditioning cycles to maintain stable cut rates are not required for medium hard glass substrates (Mohs hardness of 5–6) when run under typical operating pressures of 1.5–3.0 psi and surface speeds of 400–600ft/min measured at the pad OD. Machine motion dynamics, however, will dictate whether Trizact™ Diamond Tile 677XA pads require periodic conditioning cycles to maintain pad flatness. Most double-sided lapping machine motion profiles will adequately maintain pad flatness without periodic conditioning cycles. Most single-sided machines will require in-process or periodic conditioning to maintain pad flatness.

A discrete break-in step for fresh Trizact Diamond Tile pads is required with semiconductor and compound semiconductor substrates (Si, InGaAs, GaAs, InP), thin substrates (0.012"–0.020"), and hard crystalline material (quartz and sapphire). Additional periodic conditioning is required to maintain stable cut rates for substrates harder than Mohs 8 (sapphire, silicon carbide, etc.).

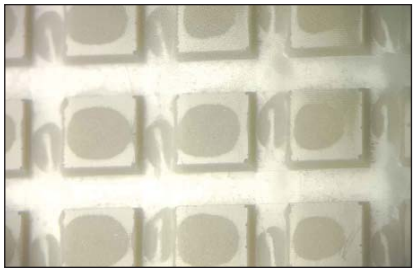
Pad Surface Characterization

Visual inspection of the pad feature surface can be used to determine whether or not a fresh Trizact™ Diamond Tile 677XA pad is sufficiently broken-in. For all of the break-in methods, the pad is sufficiently broken-in when the gloss appearance on the surface of the pad is gone. This gloss to matte transition is easily identified when the pad surface is cleaned and dried, and inspection is completed at an angle of reflection. As an alternative, a dark felt tipped permanent marker can be used to color the surface of the pad features. The pad is broken-in when the ink is completely removed from the pad surface. Various stages of break-in using both methods (standard and inked surfaces) are pictured below.

Break-In Stages – Standard Surface



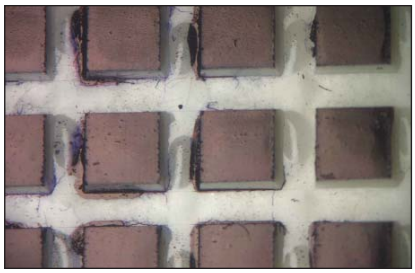
No Break-in



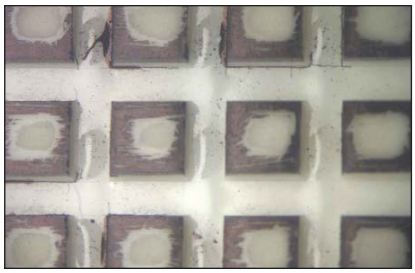
50% Break-in

100% Break-in

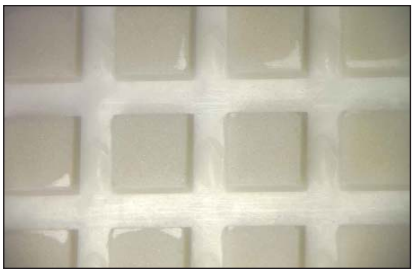
Break-In Stages – Ink Surface



No Break-in



50% Break-in



100% Break-in

It is typical to remove approx. 10% of the abrasive feature height during the pad “break-in” step.

Break-In Methods

It is possible to use rough substrates to break-in the surface of fresh Trizact™ Diamond Tile 677XA pads. For example, rough “cut” silicon wafers can be used to condition pads on single-sided machines used for silicon lapping. Blanchard or rough ground glass substrates can also be used for breaking-in pads in both single and double-sided lapping machines. Break-in is usually accomplished in 10–20 minutes with typical machine operating conditions and aqueous based lubricant.

It is also possible to use soft glass parts as a means to break-in a pad that will be used to lap harder substrates (Mohs hardness > 6). Borofloat™ glass is a good example of a soft glass substrate. Break-in is usually accomplished in 10–20 minutes with typical machine operating conditions and aqueous based lubricant.

The most versatile technique for breaking-in fresh Trizact Diamond Tile 677XA pads uses adhesive backed, 5 micron aluminum oxide, 3M™ Trizact™ Film Discs 268XA. Applying 3M Trizact 268XA Discs to solid carriers, fixtures, plates, rings, or substrates, then running with water or lubricant at 2–3 psi for 5–20 minutes will, in most cases, sufficiently break-in a fresh Trizact Diamond Tile 677XA pad. The 3M Trizact Film 268XA abrasive surface is structured and, as such, may be used for multiple conditioning cycles. The 268XA comes standard in 5" diameter discs and, as a consumable, can be discarded when they wear out. The following pages outline a break-in method using 3M Trizact Film Discs 268XA .

Break-In Procedure using 3M™ Trizact™ Film Discs 268XA

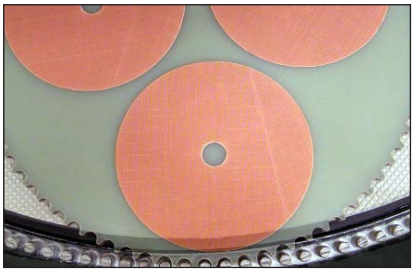
Following is the recommended technique for the break-in of 3M™ Trizact™ Diamond Tile 677XA Pads using 3M™ Trizact™ Film Discs 268XA on double-sided lapping machines:

1. A solid carrier set is recommended for the mounting of Trizact Film 268XA, 5 micron aluminum oxide discs used in this conditioning technique. (As an alternative, it may be possible to mount Trizact Film 268XA to both sides of a substrate set and load in a standard hole-cut carrier.)

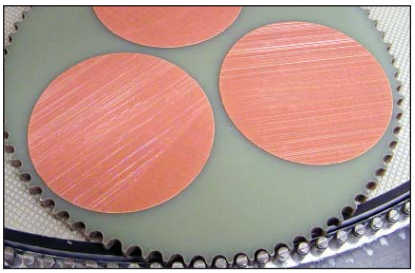
2. Adhesive backed, 5" diameter Trizact Film Discs 268XA can be mounted directly to plastic or metallic carriers. For proper adhesion, clean both sides of the carrier thoroughly, paying particular attention to oils, lubricants, and particulate contamination.

3. Mount Trizact Film Discs 268XA directly to plastic or metallic carriers using a roller to assure proper adhesion.

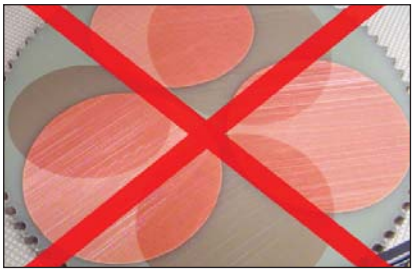
4. Position the Trizact Film Discs 268XA on the carriers such that when the carrier is placed in the lapping machine, the 268XA will overlap the 3M™ Trizact™ Diamond Tile 677XA pad at both the OD and ID.



5a. It is important to secure the Trizact Film Discs 268XA to both sides of the carrier, at exactly opposite locations. For thin carriers, this will insure proper contact of the 268XA discs with the Trizact Diamond Tile 677XA pads.

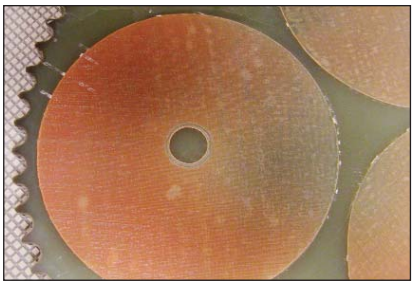


5b. Do not mount Trizact Film Discs 268XA at different locations on opposite sides of the carrier.



6. With the 3M™ Trizact™ Film Discs 268XA properly mounted to the carriers, place the carriers in the lapping machine. Set the lapping machine to run at 2–3 psi with surface speeds of 400–600 ft/min as measured at the pad OD. Use lubricant or DI water at rates (in ml/min) equal to 50% of the pad area (in in²) or use the equation; flow rate = .393 x (pad OD² – pad ID²) with flow rate expressed in ml/min and pad od/id in inches. Run 5 minute cycles, inspecting the pad surface after every cycle. Use the inspection techniques outlined above for qualifying the surface condition.

7. The Trizact Film Discs 268XA are worn out when significant areas of the backing film are exposed. When this occurs, the discs must be removed and replaced with fresh 268XA discs. When replacing Trizact Film Discs 268XA, it is important to maintain even contact pressure with the Trizact Diamond Tile 677XA by simultaneously replacing all of the 268XA discs on that side (top or bottom) of each carrier.



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