Acryliclear®

The Worlds Finest
Acrylic & Glass Polishing Systems

Acryliclear Underwater Surface Restoration

Now there is no need to go through the expense and hassle of catching and removing your livestock, bracing viewing panels and draining water and recycling your aquarium. With our Acryliclear Underwater Surface Restoral process you can remove scratches without moving anybody out. In the past, all large custom fish tanks, exhibits in both public zoos and aquariums, and all underwater windows that were in need of restoration work had to be emptied and sometimes resealed to be restored. This adds a large additional expense to a project that can now be performed in less time with less expense and less stress to the livestock that will stay home while the work is done. Our staff or any of our authorized licensees can travel to your location and restore your panels to new.

As seen on Animal Planet's hit show "Tanked"

Acryliclear Universal Algae Pads

Our Acryliclear Universal (Used for Glass and Acrylic) Algae Pads rip through Coralline and other tough algae's and are Acrylic Safe. They have been tested extensively by the industry's leading aquarium professionals and have been described as "simply the best". The starter kit includes one industrial stick Velcro backing pad that can be permanently attached to any stick, brush, or cleaning tool that you presently own so that it becomes adapted to use our pads. Universal replacement pads are also available separately. The size is 4"x5". There are endless applications for these pads.

Starter Pack:
2 Universal Algae Pads
1 Velcro backer pad

Refill Pack:
3 Universal Algae Pads

Custom sizes available by special order

Basic Acrylic Home Kit

Kit Contains:

- 400, 800, 1200 grit peel and stick papers 2 of each
- Sanding Block 1
- Hand Drill Backer Pad 1
- 2oz. Grit Reduction Polishing Paste 1
- White sanding pad 1
- White Hydroentangled Fiber Finishing Pad 1
- Cardboard box
- Instructions

Deluxe Acrylic Home Kit

Kit Contains:

- 400, 800, 1200 grit peel and stick papers 4 of each
- Sanding Blocks 1 of each 2 styles
- Micro Fiber Cloth 1
- 1, 2, 3 micron peel and stick papers 2 of each
- Hand Drill Backer Pad 1
- 4oz. Acryliclear Grit Reduction Polishing Paste 1
- Gold Pad 3”, 1
- White pad 3”, 2
- White Hydroentangled Fiber Finishing Pad 3”, 2
- Cross cut foam pad 3”, 1
- Plastic Case
- Instructions

Basic Entry Level Starter Kits

Basic Acrylic Kit:

- Jepson Polishing Tool 1
- Speed Control 1
- 5" Hook and Loop Backer Pad 1
- 5" Green, Maroon, Grey, Gold, and White Sanding Pads 3 of each
- 5" Hydroentangled Fiber Polishing Pad 3
- 5" Foam Finishing Pad 1
- 8oz. Acryliclear Grit Reduction Polishing Paste 1
- 400, 800, 1200 grit peal and stick sanding papers 3 of each
- Sanding Blocks 2
- Spray Bottle 2
- Microfiber Cloth 1
- Cardboard box 1

Basic Acrylic Underwater Kit:

- Underwater Polishing Tool 1
- 5" Hook and Loop Backer Pad 1
- 5" Peel and Stick Backer Pad 1
- 5" 15 Micron Sanding Pad 3
- 5" Gold, White Sanding Pads 3 of each
- 5" 3, 2, 1 Micron Polishing Pads 3 of each
- 5" Hydroentangled Fiber Polishing Pad 3
- Cardboard box 1

Basic Glass Kit:

- Jepson Polishing Tool 1
- Speed Control 1
- 5" Hook and Loop Backer Pad 1
- 5" 4, 3, 2, 1 Black Glass Dry Sanding Pads 3 of each
- 5" White Perforated Glass Polishing Pads 3
- Dry Powder Clay Talc 1
- 8oz. Acryliclear Grit Reduction Glass Polishing Paste 1
- Pad Dressing Stick 1
- Pad Cleaning Brush 1
- Spray Bottle 1
- Cardboard box 1

Acrylic Pro Kit

Kit Contains:

- Jepson polishing tool with 3" and 5" hook and loop and stick on backer pads, and speed control.
- Green, Maroon, Grey, Gold, White pads 3" & 5" 6 of each
- Cut foam pads 3" & 5" 3 of each
- Micron stick on pads, 1,2 & 3 micron, 5", 6 of each
- Micron hook and loop discs 15 and 30 micron 3" & 5" 3 of each
- Hydroentangled polishing pad - 3" & 5" 6 of each
- Peel and stick 400, 800, 1200 grit papers 6 of each
- Sanding blocks 2 each of 2 styles
- Aluminum Overspray tape 1 roll
- 8oz Grit Reduction Polishing Paste 2
- Acryliclear Microfiber Cloths 6
- Plastic Shop Apron 1
- Spray Bottle 1
- Safety goggles 1
- Rolling Case 1

Acrylic Pro Underwater Kit

Kit Contains:

- Underwater polishing tool
- 50’ air hose with quick disconnects
- 3” & 5” hydroentangeled polishing pad 12 of each
- 3” & 5” white sanding pad 12 of each
- 3” & 5” gold sanding pad 12 of each
- 5” Aluminum Oxide sanding pads 1, 2 & 3 micron 12 of each
- 3” & 5” 15 & 30 micron sanding pads 12 of each
- 3” & 5” peel and stick and hook and loop backer pads 1 of each
- Microfiber cloths 6
- Plastic Shop Apron 3
- Safety goggles 1
- Rolling case 1

Glass Pro Kit

Kit Contains:

- Jepson Polishing Tool with 3" and 5" peel and stick backer pads and speed control 1
- Black Dry Glass Pads Phase 4, 3, 2, 1 3" and 5" 6 of each
- White Perforated Glass Polishing Pads 3" and 5" 3 of each
- Dry Powder Clay Talc 1
- 8oz Acryliclear Grit Reduction Glass Polishing Paste 1
- Safety Goggles 1
- Plastic Shop Apron 3
- Acryliclear Microfiber Cloths 6
- Pad Cleaning Brush 1
- Pad Dressing Stick 1
- Rolling Case 1

Deluxe Pro Kit

for Acrylic, Glass & Acrylic Underwater

Kit Contains:

- Jepson Polishing Tool with 3" and 5" hook , loop backer pads and speed control
- Makita Polishing Tool
- Underwater tool with 3" and 5" hook and loop and peel and stick backer pads
- 50' air hose with quick disconnects
- Black glass pads 1,2,3,4 in 3"and 5", 6 of each
- White Perforated Glass Polishing Pads in 3" & 5", 3 of each
- Maroon, Green, Grey, White, Gold pads 6 of each 3" & 5"
- Hydroentangeled Fiber white finishing pads 3" and 5", 6 of each
- Orange cut foam polishing pads 3" and 5", 4 of each.
- Micron stick on discs 1, 2, 3 micron 5", 6 of each
- Sanding block 3 of each 2 styles
- Micron hook and loop discs 15 and 30 micron 3" and 5", 6 of each
- Peel and stick 400, 800, 1200 grit papers, 6 or each
- 8oz. Acryliclear Grit Reduction Polishing Paste for Acrylic 3
- Dry Powder Clay Talc 1
- Plastic Shop Apron 3
- Spray Bottle 2
- Pad Cleaning Brush 1
- Rubber cleaner stick 1
- Aluminum Overspray tape 1
- Clear Acrylic Masking Tape 1
- Water Tight Frog Tape™ 1 roll
- Acryliclear Microfiber Cloths 4
- Safety Goggles 1
- Rolling Case

Grit - Mesh - Micron Conversion Chart

American Standard (Grit)	Mesh	Micron	
100,000	0-0.5	1/4	Very fine and not used often commercially, mainly contest cutting or hobby cutters use it. It is seldom needed.
60,000	0-1	1/2	This is seldom used. **50,000 Grit is really what is used, and quite common for polishing Sapphire and other hard materials. You will need it.**
14,000	0-2	1	**This is the standard commercial polish for Sapphires, although I recommend going another step to 50,000. You will need it.**
13,000	1-2	1.5	This is seldom used because it is so close to 14,000...
9,000	2-3	2.5	This is seldom used because it is so close to 8,000...
8,000	2-4	3	**This is my standard pre-polish for Sapphires and other hard materials. You will need it.**
5,000	2-6	4	This is seldom used.
4,500	4-6	5	This is seldom used.
2,800	5-10	7	This is seldom used. **3,000 is the standard what you will commonly find. You will need it.**
1,800	6-12	9	This is seldom used.
1,400	8-20	14	This is seldom used.
1,200	10-20	15	This is seldom used.
1,050	12-25	18	This is seldom used.
800	20-30	25	This is seldom used.
600	20-40	30	This is a common grit and people often charge copper laps with it. **I prefer plated laps.**
500	30-40	35	This is seldom used.
325	40-50	45	This is a common grit and people often charge copper laps with it. **I prefer plated laps.**
285	50-60	55	This is seldom used.
240	60-80	70	This is seldom used. **260 is the common grit and people often charge copper laps with it. I prefer plated laps**.
225	80-100	90	This is a common grit and people often charge copper laps with it. **I prefer plated laps.**

160	100-120	110	This is seldom used.
100	120-160	150	This is a common grit and people often charge copper laps with it. **I prefer plated laps.**

How are grit/mesh/micron related and what is what?

Basically Grit, Mesh, and Micron are three different ways to measure particale size. In our case it is important because the size of the grit/polish that is being used defines the coarseness of the polish or cutting compound (laps too) that we are using to grind and or polish gemstones.

As you may know most diamond compounds/powders are sold in Grit sizes (100,000, 50,000...) in the USA.

Notice that there are some Grits that are listed that are the correct conversions, but are not commonly available for various reasons.

For example 60,000 Grit is the right number/conversion for 1/4 Micron, but you will almost never find 60,000 Grit available. **The common Grit used is 50,000.**

Note: In case you were wondering Alumina Oxide and Cerium Oxide are usually measured in Microns... Here is a link to polishes.

Note2: It is worth mentioning that just because a polish or compound says is it 14,000 Grit does not mean that it is all that size. It depends on the manufacturer and the method used to grade the compound. Some manufacturers use an average particale size and some use nothing "larger than" and so on. It also depends on the method used to actually "make" the polish/compounds. **Read the labels or ask if you are not sure.**

In general the more expensive brands do a better job of quality control and and sizing/grading of polishes and compounds. This is usually a case of you get what you pay for. Beware of very inexpensive polishes and compounds because they are usually not graded as well. It only takes one piece of grit the wrong size to scratch your stone and cause problems.

Plastic Sanding Pads

Packed in threes and used on our hand polishing tool with water.

Green - Course
Maroom - Medium
Grey - Medium Light
Gold - Light
White - Fine

Plastic Polishing Pads

Packed in threes and used on hand polishing tool with water and polish.

Hydroentangeled Fiber Initial Polish
Orange Foam Cross Cut Final Polish (packed singly)

Plastic Sanding Papers

Packed in threes self stick used on sanding blocks with water and a touch of liquid dish soap.

400 grit course | 800 grit medium | 1200 grit fine

Underwater Sanding & Polishing Pads

Packed in threes and used on the underwater hand tool, underwater.

30 micron course for very deep scratches
15 micron medium for deep scratches
Gold - light
White - fine
3 Micron Extra Fine
2 Micron Very Fine
1 Micron Super Fine
Hydroentangeled Finishing pad removes haze

Glass Sanding & Polishing Pads

Packed in threes and used on our hand polishing tool with clay powder.

Phase 1 - Course
Phase 2 - Medium
Phase 3 - Light
Phase 4 - Fine
White Performated Finishing Pad - Final Step

DUCTILE-TO-BRITTLE TRANSITION OF PLASTIC MATERIALS

This article reviews the factors that result in brittle performance of normally ductile plastic materials.

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Stork Technimet
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Plastic materials exhibit viscoelastic properties, meaning that they display both elastic and plastic (viscous) response to stress. The viscoelastic nature of polymers makes strain rate and time important factors in the performance of plastics. This article describes the effects of strain rate and discusses how materials, design, processing, and service conditions influence impact resistance. The article further reviews the effects of time on plastic materials and their susceptibility to creep failure.

Strain rate

Strain rate, the time rate of elongation, is the speed at which a deforming load is applied to a material. The strain rate dependence of plastics is a unique, distinguishing characteristic relative to the broader scope of traditional materials, including metals and ceramics. Although metals do exhibit strain rate dependence at elevated temperatures, plastics alone display this attribute in the scope of most standard operating conditions.

The application of stress through high strain rate loading results in rapid deformation of the plastic material. At faster strain rates, the polymer molecules making up the plastic component do not have time to yield and deform as they normally do in an overload condition.

Conversely, the physical response of the polymer chains under conditions of rapidly applied stress is pre-emptive disentanglement. This means that cracking initiates and continues to extend when the applied stress exceeds a minimum energy. When the energy is in excess of the total level required for initiation and complete propagation, the result is catastrophic failure.

Effects of strain rate

The effects of elevated strain rate have substantial consequences on the mechanical performance of plastic components. In general terms, a higher strain rate results in an apparent loss of ductility. Specifically, a faster strain rate will result in a lower yield stress and a reduced elongation at break, as illustrated in Fig. 1. Depending on the conditions, a high strain rate can even produce an apparent increase in modulus. This means that normally ductile plastic materials exhibit brittle behavior under conditions of high strain rate loading. In fact, the application of stress under conditions of high strain rate within plastic materials directly parallels the performance exhibited at reduced ambient temperature.

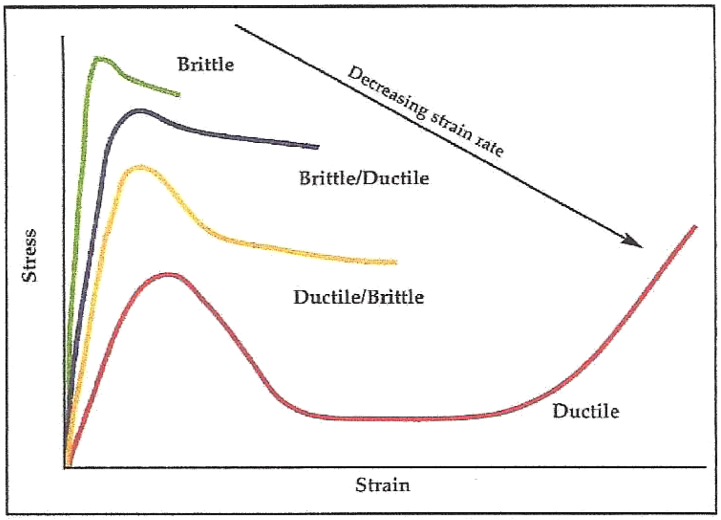

Fig. 1 — The change in tensile response is shown as a function of strain rate.

Plastics can be subjected to high strain rate loading in many ways, including rapid pressurization, snap fit installation, and impact, which is the most significant mechanism. The impact resistance of a plastic component is determined by four key factors: material composition, design, processing, and service conditions.

Material composition

Damping is the ability of a material to dissipate impact energy by converting it into heat. The composition of the material subjected to impact loading is the primary factor in determining overall performance, because it is the major determinant of damping properties. Various impact responses resulting from different material types are presented in Fig. 2. Important aspects of material composition include:

- **Polymer type**: The molecular structure of the polymer determines the chain mobility, which is a key factor in the ability of the material to yield. For this reason polystyrene, with a large pendant phenyl ring, is less impact resistant than polyethylene.
- **Molecular weight**: All material properties,

*Member of ASM International

The conditions under which a plastic component is subjected to a high strain rate event alter the ability of the material to respond.

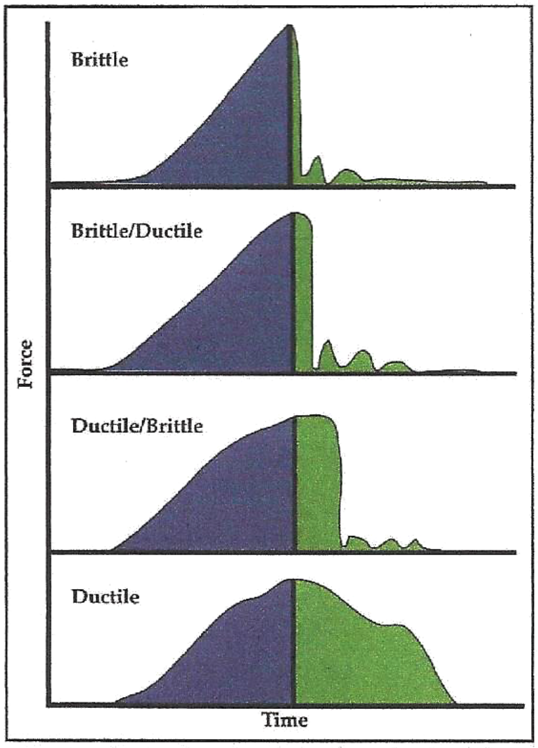

Fig. 2 — Various impact results are shown based on different material compositions and the associated damping properties. The blue portion of the curve illustrates the energy required to initiate cracking, and the green portion shows the energy absorbed after crack commencement. The bigger the ratio of total energy to crack initiation energy, the higher the level of ductility.

including impact resistance, improve with increasing molecular weight.

• **Crystallinity**: Within a family of materials, greater crystallinity is accompanied by a reduction in impact resistance. For example, low-density polyethylene is more impact-resistant than high-density polyethylene.

• **Modifiers**: Formulation ingredients that contribute to damping also improve impact resistance. Such additives include rubber and plasticizers. Additionally, copolymers often have better impact resistance than the corresponding homopolymer. For example, polypropylene copolymerized with ethylene is superior to polypropylene homopolymer.

• **Fillers**: Fillers within the plastic resin alter the impact properties. Chopped glass and most mineral fillers reduce impact resistance. However, calcium carbonate and talc can help to initiate crazing, which improves impact properties.

• **Contamination:** Contamination within a molded plastic part most often produces localized areas of poor molecular entanglement. This leads to an inherent reduction in impact resistance.

Component design

The design of the part can have a great influence on the ability of the material to accept impact loading. Important factors include:

• **Stress concentration**: Design aspects that serve as points of stress concentration increase the apparent brittle response of the material. By focusing the stress, the polymer molecules forego yielding, and conversely disentanglement results. Such stress concentrators include sharp corners, notches, grooves, recesses, holes, and even variable wall thickness and a textured surface.

• **Wall thickness:** Some plastic materials, such as polycarbonate, are sensitive to the wall thickness of the impacted area. Thicker walls lead to a reduction in the ability of the material to adequately dissipate the energy in a ductile manner, leading to brittle fracture.

Material processing

The processing of a plastic material can alter the capacity of the molecular structure to damp energy resulting from impact loading. Essential aspects of processing include:

• **Discontinuities:** Contamination, voids, or porosity within molded components provide points of stress concentration. Such defects intrinsically reduce the impact resistance of the part.

• **Fusion:** Areas of poor fusion, such as a knit line, correspond to poor molecular entanglement. These regions of the molded part are essentially more likely to disentangle rather than yield upon impact loading.

• **Orientation**: Orientation of the polymer molecules during molding alters the impact response of the material. Depending on the direction of orientation relative to the impact load, the results may be an increase or decrease in the impact resistance.

• **Molded-in stress:** Internal and external stresses are additive within a formed part; thus the presence of molded-in stress can severely reduce the level of impact stress a material can accommodate.

Service conditions

The conditions under which a plastic component is subjected to a high strain rate event alter the ability of the material to respond. These external factors include:

• **Impact speed**: Higher impact speeds translate into more rapid deformation, leading to a reduction in the ability to damp the impact energy. Thus, higher impact speeds are more severe than slower speeds.

• **Temperature**: A reduction in temperature corresponds to a more brittle response upon impact.

• **Impact fatigue**: Repeated impacts produce fatigue-like response in a plastic component. This generally results in brittle failure through premature disentanglement.

• **Striker geometry**: Sharper striker objects tend to focus impact energy more tightly, leading to higher levels of localized stress. This is more severe than the same load applied with a blunt striker, which allows energy dissipation over a wider surface.

Time under load

The viscoelastic nature of plastic materials leads not only to temperature dependence, but also to reliance on time. Specifically, the mechanical properties of a plastic material change as the material is loaded over time, as shown graphically in Fig. 3. A marked decay in the modulus is observed for plastics that are loaded statically for an extended period. The re-

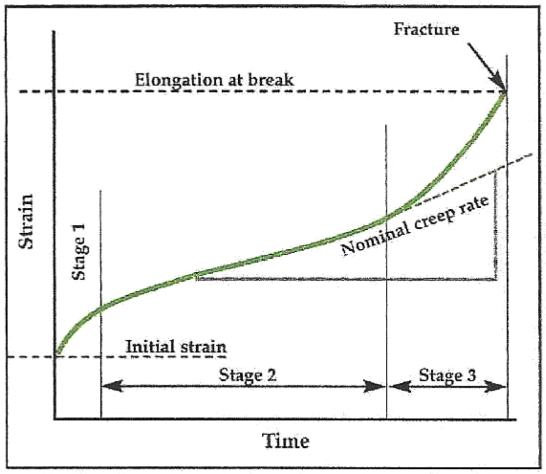

Fig. 3 — A creep curve is shown illustrating the effect of time on plastics under load. The viscoelastic nature of plastic materials leads not only to temperature dependence, but also to reliance on time.

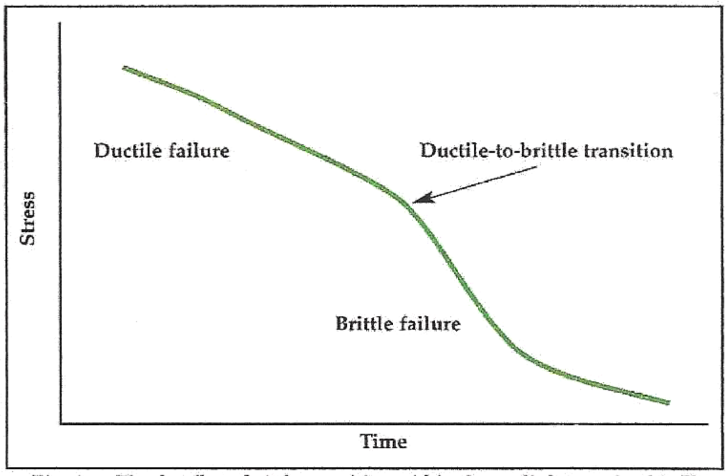

Fig. 4 — The ductile-to-brittle transition within the applied stress level is illustrated. If the stresses involved are continually below the yield point of the material, the failure is manifested as brittle fracture.

duction in modulus is the result of reorganization of the polymer chains, minimizing localized stress. At stresses below the yield point of the material, the chains reorganize through disentanglement. This subsequently leads to crack initiation, when a sufficient time/load condition has been met, and ultimately to failure through continued exposure.

If the stresses involved are continually below the yield point of the material, the failure is manifested as brittle fracture, often called creep rupture or static fatigue. This is shown in Fig. 4. The susceptibility of plastics to creep is uniquely different than the properties exhibited by most metals.

Short-term mechanical properties, such as tensile or flexural strength, are inadequate to predict the long-term load-bearing capabilities of a plastic material. While they are useful in assessing overload conditions, no inference can be made regarding the effect of time on a component. Creep testing is required to predict the effective life of a statically loaded component, either through the traditional method of hanging weights on a creep stand, or by dynamic mechanical analysis.

Semicrystalline polymers such as polyethylene and polypropylene are inherently more susceptible to creep than amorphous resins, because semicrystalline resins generally have glass transition temperatures (T_g) below ambient. At temperatures above T_g, the molecular structure comprising the material has sufficient energy to allow the mobility required for creep.

Although amorphous resins show a lesser tendency to creep, materials containing rubber constituents show a clear creep response, such as acrylonitrile:butadiene:styrene (ABS) resin and high impact modified polystyrene (HIPS). In general, the aspects of material structure and composition that give materials good impact resistance impart a proclivity to creep. The exception to this is molecular weight. As with any mechanical property, creep resistance improves with increasing molecular weight.

Creep failure

Creep failure is mechanistically similar to environmental stress cracking (ESC). ESC takes place when a susceptible plastic material is subjected to tensile stresses while in contact with a chemical agent that accelerates the failure. However, absent the chemical, the cracking would still take place over a longer period of time through creep. In other words, creep is an example of environmental stress cracking in which the chemical agent is air.

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