

10X PERFORMANCE  
IMPROVEMENT  
SCIENCE  
INTRODUCES...

**ULTRA SAFE**  
**ULTRA HIGH-PERFORMANCE**  
**ULTRA LOW-CONSUMPTION**

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# **SUPEROXALLOY** **ABRASIVES**

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**10X** ENGINEERED  
MATERIALS

# ■ WHAT'S A SUPEROXALLOY ABRASIVE?

## **SUPEROXALLOY**

*(soo-per-ox'-uh-loy)*

an engineered alloy of oxide minerals created through highly controlled formulation and tempering (high heat + rapid cooling). The process creates non-crystalline (amorphous) particles that resist breakage under stress of high-speed mechanical impact.

[ *From metallurgy/minerology: superalloy + oxide* ]

## OXIDE

hard, strong mineral compound consisting of elements bonded with oxygen.

## ALLOY

integrated solid made of two or more elements. Mechanical properties differ and often exceed those of its components.

# SUPER

# OX

# ALLOY

## SUPERALLOY

enhanced alloy exhibiting superior properties over conventional alloys.

# PROCESS IMPROVEMENT SCIENCE CREATES AN ALL-NEW CLASS OF BLASTING MEDIA

## THREE STEPS TO THE FIRST SUPEROXALLOY ABRASIVE

01

### DISCOVERY

"So...what have we here?"

#### ✗ Task

Unleash a team of process improvement scientists to find new uses for highly plentiful, formulated, and tempered, vitreous materials generated from a molten mineral oxide blend that has been formed and rapidly quenched.

Work to do...

#### ✗ Hypothesis: Blasting abrasive?

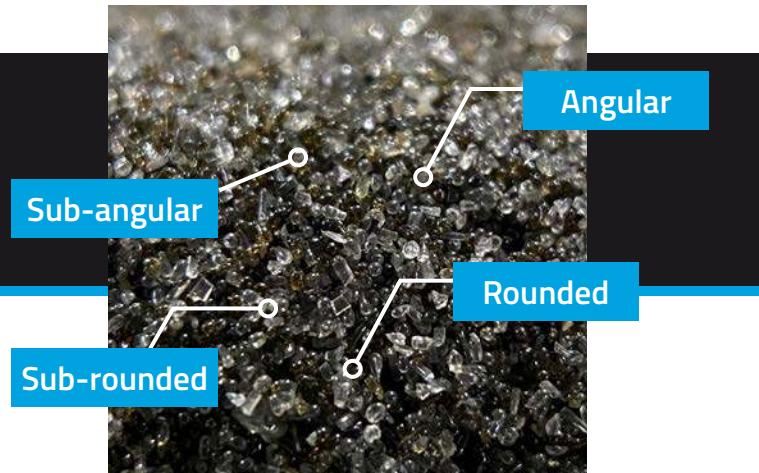
Sample analysis shows the **substance exhibits some unusual and advantageous properties**—toughness, an “alloyed” non-crystalline (amorphous) structure with no planes of weakness, presence of beneficial oxides (including hard/tough aluminum oxide and silicon dioxide), extremely high consistency of composition: from lot-to-lot and year-to-year, excellent safety profile (no beryllium, no heavy metals)—and unique particle shapes: angular, sub-angular, sub-rounded and rounded. Since the raw material isn’t mined, it doesn’t have any of these environmental concerns—and no worries about inconsistency of quality from mine to mine. Further material tests reveal a highly consistent shape distribution.

A casual mention to an acquaintance draws an intriguing reaction: “You folks may have just discovered the perfect blasting abrasive.”

More work to do...



High-heat tempering melts together the 10X oxide mineral formulation to create toughened, amorphous superoxalloy particles



**Polymorphous means “many shapes.”**

And that’s what you’ll find when you examine 10X superoxalloy abrasives. Each shape can perform different tasks in a blasting job. That’s why 10X abrasives can perform multiple blasting steps in one, and deliver a clean, ready-to-coat surface with no embedment concerns.

### Assessment: Blasting abrasive!

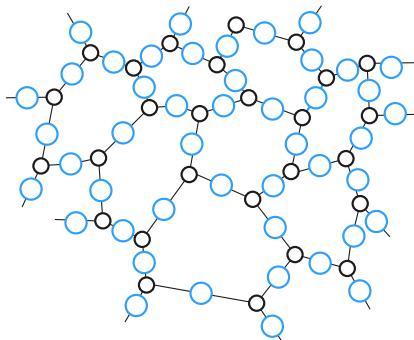
Although the work proves difficult, **the team produces pure prototype lots of abrasive—then recruits blasters to pilot test it.** And test, they do.

Blasters tell the 10X team—in their own words—“This stuff works better.”

Testers say it’s “better”...“faster”...and “cleaner” than other abrasives. And that the 10X particles don’t embed like older class materials: garnets, slags, metals and glass. They remark how they get a better surface profile and near-zero dust. Each blaster also asks: “When can I get more? What’s the cost?” And “What is it?”

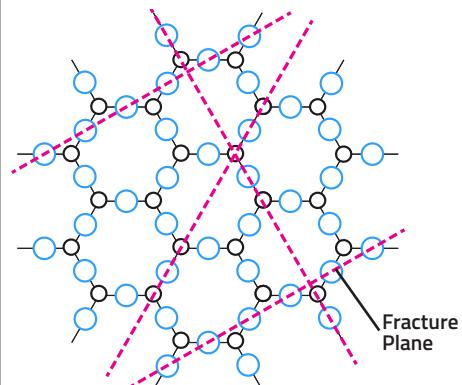
Much more work to do...

### 10X SUPEROXALLOY ABRASIVE



### AMORPHOUS PARTICLE

### SLAGS, GARNET, ALUMINUM OXIDE



### CRYSTALLINE PARTICLE

## WHY CAN A CRYSTAL BREAK APART MORE EASILY THAN AN AMORPHOUS PARTICLE?

See the pink lines above? Those are fracture planes—precise lines of weakness—points at which the particles more easily break apart. Fracture planes like this are what make crystals, crystals. Amorphous particles, like those found in 10X superoxalloy abrasives, have no fracture planes. Their random arrangement interlocks, like pieces of a jigsaw puzzle. Amorphous particles exhibit no predictable planes of weakness. They’re equally strong in all directions. Chemists use the term “isotropic” to describe this strength phenomenon. Amorphous, isotropic particles are why 10X superoxalloy abrasives resist breakage up to 120 PSI or higher, produce very little dust and can be reused many times.

# PROCESS IMPROVEMENT SCIENCE CREATES AN ALL-NEW CLASS OF BLASTING MEDIA

## 02

## DEVELOPMENT

Does the 10X breakthrough abrasive really work... and besides, what is it? And how is it made?



10X superoxalloy abrasives pass the pour test...virtually no dust when you pour it out of your hand or bag.

### ✖ Tasks

**Prove** the product works in the real world. **Source** raw material supply. **Engineer** a sustainable manufacturing process to extract and purify the abrasive from the raw material and produce millions of pounds of finished product annually. And if the real-world testing proves out? **Create** a company. **Secure** patents...then **construct** a plant.

### ✖ Testing: Dirty jobs...sparkling results

The team takes 10 tons of prototype product to blasters for commercial scale testing: real jobs, real people, with real problems to solve. Results? Same or better than pilot testing.

Using various grit sizes matched to the job, blasters tell us 10X abrasive removes tough coatings—powder and epoxy coatings that usually require baking and scraping or chemical treatment. They say it resists rust bloom. Blasters have told us they have seen the 10X abrasive remove heavy rust and thick coatings at a speed 30%, 40%, 50% even 60% faster than other abrasives while leaving behind a clean, ready-to-coat surface profile. "Leaves an ideal finish on stainless steel," said one blaster.

Others say the new product blasts off tough coatings, preps the surface and cleans—all in one step. Blasters tell us—no, they **insist**—it works better than garnet...better than slags...better than steel grit...steel shot...staurolite...crushed glass and glass bead. Multiple testers describe how the particles resist breakage and dustiness at blasting pressures up to 120 PSI or **even higher**...and can still be reused multiple times. They tell us they like the clean, green, health and safety features—no free silica exposure, no beryllium and no heavy metals. They say it performs, in finer grit sizes, as well as or better than expensive, clean, ultra-high-performance aluminum oxides, silicon carbides and ceramics.

## WHAT USERS SAY



"How soon can we purchase...?"

“...increased efficiencies by a minimum 30% against garnet, coal slag and copper slag.”

“...don’t think I’ve seen anything work as effectively on paint (removal)...’Rockstar’ stuff.”

“game-changing abrasive technology...”

## ✖ It's different from any other abrasive. So, what is it?

Yes, it performed differently and in a unique way. But there was more...

The 10X technical team looked deeper. To the physical, mechanical and elemental properties. What they found were unique features never seen before in an abrasive material...

Polymorphous particle shapes. Amorphous, isotropic particles—with no crystalline fracture planes. And a unique material composition of toughened oxide minerals (SiO<sub>2</sub>, CaO, MgO, Al<sub>2</sub>O<sub>3</sub> and FeO).

They concluded it simply isn't like any existing or known category of abrasive. It's not garnet, slag, aluminum oxide or ceramic. So, what is it?

The scientists who made the discovery have described the entirely new category of material as a **"superoxalloy"—an alloy of oxide minerals that show improved mechanical properties compared to conventional mineral or metal abrasives.**

## ✖ Go! Construct the world's first "superoxalloy" manufacturing plant

10X engineers a production process and constructs a modern, clean and controlled manufacturing facility designed to convert raw material into ready-to-use superoxalloy abrasives.

Harnessing aerosol physics and mechanical separation techniques, a first-of-its-kind plant optimizes output tonnage and quality while reducing energy use and labor costs. The process takes raw material and converts it into highly pure, highly consistent, made-to-spec superoxalloy abrasives.

Further purification de-dusts and removes any ferrous materials. Product sorting, grit size screening and packaging completes the process.

So...after more than a year of planning, engineering and plant construction, how did things turn out? A small, but growing "10X Nation" held its breath as our chief engineer "flipped the switch."

And...10X plant #1 worked as designed. Mission accomplished.

Back to work...



Super sacks ready for delivery at our clean tech facility in Wabash, Indiana.

“...cost savings from a cost-per-square-foot basis...”

“Amazing...”

“...cutting through things at a much faster pace...”

“Leaves a nice low profile... super-easy to clean off compared to coal slag. At this point, I'll never go back.”

“...health & safety and quality really round out the value...”

“...wasn't expecting such a difference...”

# PROCESS IMPROVEMENT SCIENCE CREATES AN ALL-NEW CLASS OF BLASTING MEDIA

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## COMMERCIALIZATION

Bring the world's first superoxalloy abrasives to market

### ✗ Task

**Develop** product lines, packaging, grit sizing and customer support. And do it with a resolve to **deliver** a "10 times (10X) more value" breakthrough to customers. (OK, we may never quite get there...but what's the harm in trying?)

## HOW 10X MANUFACTURES SUPEROXALLOY ABRASIVES...



### RAW MATERIAL

1

### SEPARATION & PURIFICATION



### REFINING/DE-DUSTING

2



### CLASSIFICATION



### PACKAGING

4

# SUMMARY 10X PROCESS IMPROVEMENT ABRASIVES

## ✖ World's first superoxalloy

- All-new class
- Formulated, tempered
- Unique particle shapes and form

## ✖ Ultra high-performance—reduces surface prep cost, improves quality

- Ultra-efficient: increased throughput
- Ultra-effective: better results
- Ultra low-consumption: economical

## ✖ Safe—no beryllium, free silica or heavy metals

- Clean health and safety profile for workers and environment
- Extremely low dust
- Sustainable

**READ ON TO LEARN MORE ABOUT TWO BREAKTHROUGH PRODUCT LINES FROM 10X...**



HIGH-PRODUCTION GRADES



PRECISION GRADES



# SUPER-FAST, COST-EFFICIENT ABRASIVE FOR DEMANDING, HIGH-VOLUME BLASTING JOBS



## HIGH-PRODUCTION GRADES

**Solves big, complex production challenges...**



### NEED FOR SPEED IN VOLUME

- Big projects with tight, rigid production timetables
- Work schedules with no time allowance for post-blast cleaning or rework
- Settings where poor worker visibility caused by abrasive dust reduces speed (and quality)
- Critical assets back online faster
- Eliminate hand-tooling ahead of blasting



### REDUCING TOTAL JOB COST

- Jobs of sufficient scale—where increased speed and reduced abrasive consumption can deliver payback in reduced cost per sq. ft.
- Reduce rework from embedment, rust bloom and coating failure
- Less cleanup and disposal costs



KinetiX high-production grade superoxalloy abrasives: super-fast, cost-efficient abrasive for demanding, high-volume blasting jobs



## DIFFICULT-TO-REMOVE COATINGS

- Remove thick coatings, elastomers, multi-layers, two-part epoxies, fusion bonded, polyurea, tank liners, marine coatings and more



## QUALITY & RESULTS

- Uniform surface profile across expansive areas
- Environments where low visibility from abrasive dust could compromise craftsmanship
- Ultra-clean jobsite required
- Delayed rust bloom and low-to-no embedment
- Tackle more jobs per year through increased productivity



## SAFETY

- Exceptional worker safety
- Exceptional environmental safety: air and water quality
  - Can be harmlessly left on the ground or in water (TCLP)

# SUPER-FAST, COST-EFFICIENT ABRASIVE FOR DEMANDING, HIGH-VOLUME BLASTING JOBS

## KINETIX ON THE JOB...

### Difficult coatings



**Bottom line:** with ultra-effective KinetiX, this ultra-thick, typically difficult to remove coating didn't stand a chance.

### KINETIX: REMOVES 200+ MIL OF PAINT LAYERS, ELIMINATING BAKING AND SCRAPING

A painting contractor put KinetiX 20/40 superoxalloy abrasive to work at 125 PSI to remove multiple coating layers from this paint rack. It immediately cut through roughly 250 mil of coatings. The contractor reported no other abrasive in the shop had been able to remove this ultra-thick coating.

### Delay rust bloom

#### KINETIX: PREVENTS FLASH RUSTING WITHOUT CHEMICAL INHIBITORS



Ship hull blasted and left fully exposed to humidity for 2 weeks. Maintained SSPC-SP6 outside the rain runoff areas.

Flash rusting is a common headache when blasting with legacy abrasives. Embedded abrasive particles accelerate the corrosion process, resulting in increased prep time and shortened useful coating life.

With KinetiX, blasters can say, "goodbye" to rust bloom. There's no need for extra steps, like chemical treatment, or extra equipment, like dehumidifiers.



Copper slag



Garnet



KinetiX 40/70

24 hours after blasting, areas blasted with copper slag and garnet begin to show signs of rust bloom. Area blasted with KinetiX shows no signs of rust. Ready to coat.



Copper slag



Garnet



KinetiX 40/70

48 hours after blasting, rust continues to develop on areas blasted with copper slag and garnet. Areas blasted with KinetiX show no signs of rust bloom. Ready to coat.

# KINETIX PACKAGING OPTIONS

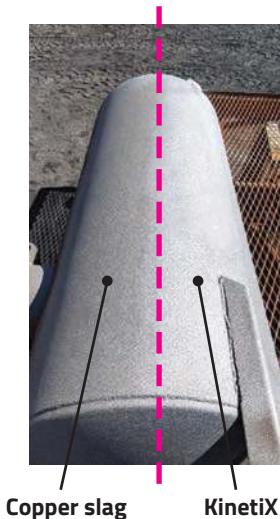
## Ultra low-consumption

### KINETIX: 74% LESS BLASTING MEDIA CONSUMED WITH KINETIX VS. COPPER SLAG

The contractor on this job blasted through 50 lb. of copper slag 20/40 in 2 minutes 43 seconds to remove 5 sq. ft. of rust from this tank. When the blasting media was switched, 50 lbs. of Kinetix 20/70 superoxalloy abrasive finished the rest of the job in 10 minutes 8 seconds. The copper slag area showed visible signs of embedment. The Kinetix area? A brighter, cleaner, ready-to-coat surface with no embedment.



**Bottom line:** less Kinetix abrasive use and an increase in speed produced a 33% cost savings for the job compared to copper slag.



- ✗ 4000 lb. super sacks (pictured)
- ✗ 2000 lb. super sacks
- ✗ 50 lb. bags (40 bags per pallet)
- ✗ Pneumatic truckloads

## High-performance



### KINETIX: FASTER THAN GARNET AT REMOVING EPOXY, LESS ABRASIVE CONSUMED

Kinetix 20/70 superoxalloy abrasive blasted through this 3.54 sq. ft. area of epoxy (25-35 mil thick) nearly 40% faster than garnet 30/60. In addition, the Kinetix test area consumed about 1/3 less abrasive vs. garnet test area.

**Bottom line:** compared to garnet, Kinetix superoxalloy abrasive delivered a 23.6% reduction in total job cost.

# ULTRA HIGH-PERFORMANCE FOR DEMANDING MANUFACTURING APPLICATIONS



## PRECISION GRADES

**Solves “pursuit of excellence” challenges**



### WHEN SURFACE QUALITY MATTERS

- Exacting surface quality, profile, appearance and uniformity requirements
- Zero tolerance for iron contamination or embedment
- Ultra-low blasting abrasive dust



### HIGH-EFFICIENCY MANUFACTURING AND FABRICATION PROCESSES

- Speed: reduce time required for surface preparation
- Produce clean, finished surface in one step, with no required secondary finishing, cleaning or polishing
- Reduce blasting media consumption: contain and reuse abrasives
- Reduce/eliminate throughput disruption caused by rework
- Eliminate time and cost of chemical pre-treatment

**REPLACES ALUMINUM OXIDE, SILICON CARBIDES AND CERAMICS AT A LOWER COST.**



**EpiX precision grade superoxalloy abrasives: Ultra high-performance for demanding manufacturing applications**



## EFFICIENT, PRECISION COATING REMOVAL

- Remove thick, tough powder coatings, elastomerics, multi-layers, two-part epoxies—with no burn off or scraping



## STRICT ENVIRONMENTAL, HEALTH, AND SAFETY (EH&S) BLASTING REQUIREMENTS

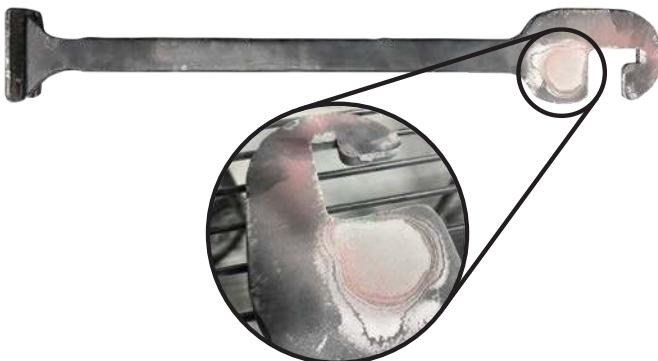
- Clean blasting abrasives
- Unmatched worker safety
  - No free silica or crystalline content
  - No heavy metals
  - No beryllium
- Unparalleled environmental safety: air and water quality
  - Can be harmlessly left on the ground or in water (TCLP)

# ULTRA HIGH-PERFORMANCE FOR DEMANDING MANUFACTURING APPLICATIONS

## EPIX ON THE JOB...

### Ultra high-performance

150 SECONDS WITH ALUMINUM OXIDE



20 SECONDS WITH EPIX EP



WITH ALUMINUM OXIDE

At 2 minutes 30 seconds: less than 10% of powder coating removed.

WITH EPIX EP

At 20 seconds: entire part cleaned and restored, leaving a profiled surface ready for use.

### Process improvement

#### EPIX: DOES THE JOB IN 1 STEP VS. 3

For this maintenance job, the contractor normally performed three separate blasting steps: 1) silica sand to clean frame and weld marks, 2) glass beads to reduce profile and 3) fine media to achieve an aesthetic finish.

**One blasting step with EpiX superoxaloy abrasive performed all 3: clean, profile and finish**—and delivered a ready-to-coat surface profile of 1.8 mil. Effective and efficient. And EpiX performed the job faster, while using dramatically less abrasive vs. the old three-step method.



Stainless steel frame prior to blasting

Finished stainless steel frame blasted **ONCE** leaving a 1.8 mil profile, ready for coating

# EPIX PACKAGING OPTIONS

## Superior surface cleanliness

### EPIX: QUANTUM LEAP IN PRODUCTIVITY, QUALITY, MANUFACTURED PART YIELD AND PROFITABILITY

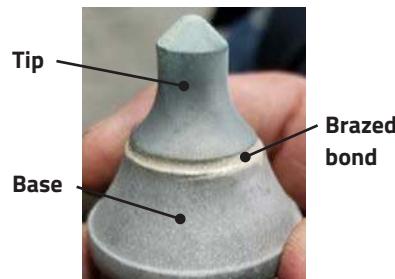
Asphalt milling and removal bits are submitted to extreme pressure (up to 8,000 PSI). Bits are formed from tungsten carbide and require blasting to remove a carbonized coating left over from the manufacturing process.

Using silicon carbide, blasters would spend 30-60 minutes cleaning the surface before treating the underside of the tips with flux cleaning agent and then brazing the tip to the base of the part. Often the brazed bits would fail in testing and require rework.

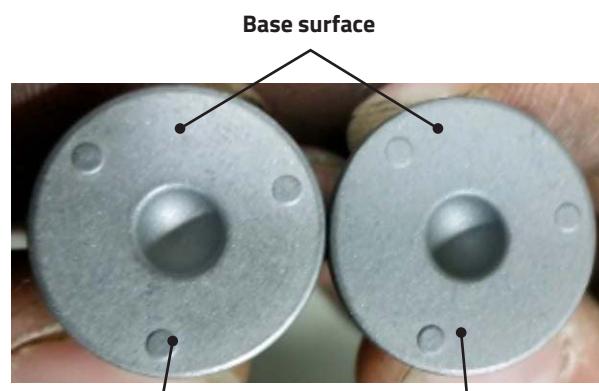
With EpiX EP, 10 minutes of blasting delivered the desired surface profile and eliminated the need for flux cleaning reducing surface preparation time by 67%. The brazed bond, tested without flux, did not fail. At 18,000 PSI, the tungsten carbide tip cracked. EpiX EP delivered a clean bond that exceeded the strength of tungsten carbide.

#### FINISHED PART:

Tungsten carbide asphalt milling and removal bit.



- ✗ 4000 lb. super sacks (pictured)
- ✗ 2000 lb. super sacks
- ✗ 50 lb. bags (40 bags per pallet)
- ✗ Pneumatic truckloads



Silicon carbide at 30 minutes of blasting.  
Delivered partially prepped surface—flux cleaning required.

EpiX EP at 10 minutes of blasting. Delivered finished profile—no flux cleaning required (2 steps in 1).

#### TEST RESULTS:



Bond failure @ 5,000 PSI with silicon carbide surface preparation.



Bond withstood 18,000 PSI with EpiX EP surface preparation—the tungsten carbide broke before the bond.

# SUPER-FAST, COST-EFFICIENT ABRASIVE FOR DEMANDING, HIGH-VOLUME BLASTING JOBS



Superoxalloy Abrasive

	KINETIX 10/20	KINETIX 20/40	KINETIX 20/70	KINETIX 40/70
				
<b>ABRASIVE CLASS</b>	Superoxalloy	Superoxalloy	Superoxalloy	Superoxalloy
<b>GRIT SIZE</b>	10/20 Mesh	20/40 Mesh	20/70 Mesh	40/70 Mesh
<b>DESCRIPTION &amp; APPLICATIONS</b>	<ul style="list-style-type: none"> <li>▪ Extra coarse abrasive</li> <li>▪ Thick or hard coatings</li> <li>▪ Extra deep profile</li> <li>▪ Corrosion &amp; coating removal</li> <li>▪ Oil, dirt &amp; grease removal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Coarse abrasive</li> <li>▪ Thick or hard coatings</li> <li>▪ Deep profile</li> <li>▪ Corrosion &amp; coating removal</li> <li>▪ Oil, dirt &amp; grease removal</li> </ul>	<ul style="list-style-type: none"> <li>▪ All-purpose abrasive for speed and profile</li> <li>▪ Thick or hard coatings</li> <li>▪ Medium profile</li> <li>▪ Corrosion, coating &amp; mill scale removal</li> <li>▪ Oil, dirt &amp; grease removal</li> </ul>	<ul style="list-style-type: none"> <li>▪ General all-purpose abrasive</li> <li>▪ Medium-to-thick coatings</li> <li>▪ Medium profile</li> <li>▪ Corrosion, coating &amp; mill scale removal</li> <li>▪ Oil, dirt &amp; grease removal</li> <li>▪ Stone cutting &amp; engraving</li> </ul>
<b>SURFACE PROFILE</b>	4.0-6.0 mil	2.5-4.0 mil	2.5-3.5 mil	2.0-3.0 mil
<b>RECOMMENDED PRESSURE AT THE NOZZLE (PSI)</b>	>100	>100	>100	>100
<b>MOHS HARDNESS</b>	7-8	7-8	7-8	7-8
<b>REUSABILITY @ 100 PSI</b>	2 times	2-4 times	2-6 times	4-6 times
<b>WORKING SPEED</b>	Very fast	Very fast	Very fast	Very fast
<b>DUST RATING</b>	Low	Low	Low	Low
<b>SPECIFIC GRAVITY</b>	2.7-2.9	2.7-2.9	2.7-2.9	2.7-2.9
<b>BULK DENSITY</b>	87-92 lb/ft <sup>3</sup>	90-95 lb/ft <sup>3</sup>	93-103 lb/ft <sup>3</sup>	95-105 lb/ft <sup>3</sup>
<b>MELTING TEMPERATURE</b>	1,150°C / 2,102°F	1,150°C / 2,102°F	1,150°C / 2,102°F	1,150°C / 2,102°F
<b>FREE IRON CONTENT</b>	None	None	None	None
<b>FREE SILICA CONTENT (NIOSH METHOD 7500)</b>	Not detected	Not detected	Not detected	Not detected
<b>BERYLLIUM CONTENT (SSPC-AB1 SECTION B.4.1)</b>	Not detected	Not detected	Not detected	Not detected

# ULTRA HIGH-PERFORMANCE FOR DEMANDING MANUFACTURING APPLICATIONS



Superoxalloy Abrasive

ABRASIVE CLASS	EPIX EP (ENHANCED PROFILE)	EPIX MP (MEDIUM PROFILE)	EPIX LP (LOW PROFILE)
<b>DESCRIPTION &amp; APPLICATIONS</b>	<ul style="list-style-type: none"> <li>▪ Enhanced, uniform profile</li> <li>▪ Extra hard or tough coatings</li> <li>▪ Mill scale removal</li> <li>▪ Weld cleaning</li> <li>▪ Oil, dirt &amp; grease removal</li> <li>▪ Stone cutting &amp; engraving</li> <li>▪ Safe for stainless steel</li> <li>▪ Clean, bright, SP 5 finish</li> </ul>	<ul style="list-style-type: none"> <li>▪ Uniform, medium profile</li> <li>▪ Extra hard or tough coatings</li> <li>▪ Mill scale removal</li> <li>▪ Weld cleaning</li> <li>▪ Oil, dirt &amp; grease removal</li> <li>▪ Stone cutting &amp; engraving</li> <li>▪ Safe for stainless steel</li> <li>▪ Clean, bright, SP 5 finish</li> </ul>	<ul style="list-style-type: none"> <li>▪ Minimal profile</li> <li>▪ Coating removal</li> <li>▪ Mill scale removal</li> <li>▪ Weld cleaning</li> <li>▪ Oil, dirt &amp; grease removal</li> <li>▪ Surface etching</li> <li>▪ Safe for stainless steel</li> <li>▪ Clean, bright, SP 5 finish</li> </ul>
<b>RECOMMENDED PRESSURE AT THE NOZZLE (PSI)</b>	Application dependent	Application dependent	Application dependent
<b>MOHS HARDNESS</b>	7-8	7-8	7-8
<b>REUSABILITY @ 100 PSI</b>	4-8 times	6-12 times	8-15 times
<b>WORKING SPEED</b>	Very Fast	Very Fast	Very Fast
<b>DUST RATING</b>	Low	Low	Low
<b>SPECIFIC GRAVITY</b>	2.7-2.9	2.7-2.9	2.7-2.9
<b>BULK DENSITY</b>	100-110 lb/ft <sup>3</sup>	100-110 lb/ft <sup>3</sup>	100-110 lb/ft <sup>3</sup>
<b>MELTING TEMPERATURE</b>	1,150°C / 2,102°F	1,150°C / 2,102°F	1,150°C / 2,102°F
<b>FREE IRON CONTENT</b>	None	None	None
<b>FREE SILICA CONTENT (NIOSH METHOD 7500)</b>	Not detected	Not detected	Not detected
<b>BERYLLIUM CONTENT (SSPC-AB1 SECTION B.4.1)</b>	Not detected	Not detected	Not detected

# ULTRA-SAFE: FOR WORKERS AND THE ENVIRONMENT

## 10X SUPEROXALLOY ABRASIVES: NO BERYLLIUM, FREE SILICA OR HEAVY METALS

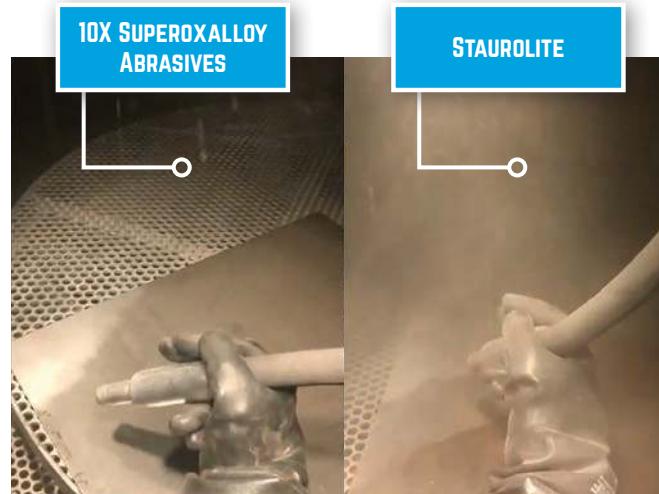


### CLEAN HEALTH AND SAFETY PROFILE FOR WORKERS AND ENVIRONMENT

- Can be harmlessly left on the ground or in water (TCLP)
- No beryllium, free silica or heavy metal



### EXTREMELY LOW DUST



### SEE HOW DUST-FREE? THE 10X DIFFERENCE IS CLEAR.

Looking for a cleaner, dust-free work site? 10X superoxalloy abrasives create a low-dust work environment. The clear view with 10X helps operators deliver higher quality results in less time.



### SUSTAINABLE

- Sustainably manufactured in an ultra-low carbon footprint, clean tech manufacturing facility
- Can be reused multiple times

# 10X SUPEROXALLOY ABRASIVES

## TOXICITY CHARACTERISTICS LEACHING PROCEDURE TESTING

SUBSTANCE	TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC)			SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)		
	TTLC REPORTING LIMIT (MG/KG)	TTLC REGULATORY LIMIT (MG/KG)	10X TTLC LEVEL (MG/KG)	STLC REPORTING LIMIT (MG/L)	STLC REGULATORY LIMIT (MG/L)	10X STLC LEVEL (MG/L)
ANTIMONY AND/OR ANTIMONY COMPOUNDS	3.85	500	Not Detected	0.0800	15	Not Detected
ARSENIC AND/OR ARSENIC COMPOUNDS	3.85	500	Not Detected	0.0800	5	Not Detected
BARIUM AND/OR BARIUM COMPOUNDS (EXCLUDING BARITE)	3.85	10,000	164	0.0800	100	2.74
BERYLLIUM AND/OR BERYLLIUM COMPOUNDS	3.85	75	Not Detected	0.0800	0.75	Not Detected
CADMIUM AND/OR CADMIUM COMPOUNDS	3.85	100	Not Detected	0.0800	1	Not Detected
CHROMIUM (VI) COMPOUNDS	0.79	500	Not Detected	0.0200	5	Not Detected
CHROMIUM AND/OR CHROMIUM (III) COMPOUNDS	9.63	2,500	Not Detected	0.200	5	Not Detected
COBALT AND/OR COBALT COMPOUNDS	3.85	8,000	Not Detected	0.0800	80	Not Detected
COPPER AND/OR COPPER COMPOUNDS	9.63	2,500	Not Detected	0.200	25	Not Detected
FLUORIDE SALTS	3.98	18,000	Not Detected	1.00	180	Not Detected
LEAD AND/OR LEAD COMPOUNDS	3.85	1,000	Not Detected	0.0800	5	Not Detected
MERCURY AND/OR MERCURY COMPOUNDS	0.121	20	Not Detected	0.0005	0.2	Not Detected
MOLYBDENUM AND/OR MOLYBDENUM COMPOUNDS	3.85	3,500	Not Detected	0.0800	350	Not Detected
NICKEL AND/OR NICKEL COMPOUNDS	3.85	2,000	Not Detected	0.0800	20	Not Detected
SELENIUM AND/OR SELENIUM COMPOUNDS	3.85	100	Not Detected	0.0800	1	Not Detected
SILVER AND/OR SILVER COMPOUNDS	3.85	500	Not Detected	0.0800	5	Not Detected
THALLIUM AND/OR THALLIUM COMPOUNDS	3.85	700	Not Detected	0.0800	7	Not Detected
VANADIUM AND/OR VANADIUM COMPOUNDS	3.85	2,400	10.5	0.0800	24	0.121
ZINC AND/OR ZINC COMPOUNDS	9.63	5,000	Not Detected	0.200	250	0.589

## 10X SUPEROXALLOY ABRASIVES MATERIAL COMPOSITION

OXIDE	CAS NUMBER	WEIGHT %
SILICON DIOXIDE*	7631-86-9	33-43
CALCIUM OXIDE	1305-78-8	23-33
MAGNESIUM OXIDE	1309-48-4	8-14
ALUMINUM OXIDE	1344-28-1	7-13
IRON OXIDE	1345-25-1	1-5

\*amorphous

## 10X SUPEROXALLOY ABRASIVES FREE SILICA ANALYSIS RESULTS

10X superoxalloy abrasives are regularly tested for crystalline free silica in accordance with NIOSH method 7500 with the detection limit of 0.10%. Free silica has never been detected in samples of 10X superoxalloy abrasives analyzed by multiple independent, certified laboratories (Analytics Corp, Clark Testing, KTA Tator, SGS Galson).

# SUPEROXALLOY PROCESS IMPROVEMENT ABRASIVES AND 10X ENGINEERED MATERIALS

## FREQUENTLY ASKED QUESTIONS

### [HARDNESS]

✗ **How can 10X KinetiX and EpiX abrasives rate a 7-8 on the Mohs hardness scale and yet work more effectively than Mohs 8 and 9 abrasives? Isn't hardness the determining factor in abrasive performance?**

- It is generally accepted that harder abrasives are always more effective in removing coatings and producing an anchor profile on surfaces. However, the performance of superoxalloy abrasives is showing that this isn't always the case. There are other material attributes, like particle shape and toughness, that also play significant roles in abrasive performance. Consider particle toughness, or the ability of a particle to withstand compressive forces and resist breaking (which is different from hardness).

Abrasive blasting is, at its core, an energy transfer process. Blasters invest in air compressors and the fuel to run them to accelerate abrasive particles to very high speed, which is a high energy state. The objective is to deliver the energy of those particles to a surface being treated in the most efficient manner possible. If a particle breaks on impact with a surface, no matter how hard it is, a significant portion of the particle's energy is lost to the break. Far less energy is delivered to the surface where it is needed. It's like hitting a baseball when the bat breaks. The ball doesn't go anywhere. But if the bat doesn't break, it can be a home run. It is the same in abrasive blasting. A particle that doesn't break can outperform a harder particle that does. We see 10X abrasives accomplish this routinely in the field, even against harder abrasives, and especially when customers run our products at the higher pressures that we recommend.

### [SURFACE QUALITY]

✗ **You say 10X abrasives can produce a clean, finished, ready-to-coat surface in one step, even on demanding jobs where extra cleaning steps are required. Other abrasives don't do this. How is it that 10X abrasives can?**

- The short answer is that 10X abrasives can do this because they are comprised of superoxalloy particles with a unique distribution of particle shapes. Abrasives that are primarily angular or sub-angular, or that are friable (prone to shatter), tend to embed in surfaces and can often require subsequent preparation steps after the initial blast to achieve a desired surface finish. We've previously described how and why 10X abrasives do not embed in surfaces. Beyond that, and just as important, KinetiX and EpiX come in an array of particle shapes. Some are angular, others rounded and some in-between. Should an angular particle ever embed, a more rounded particle soon comes along to remove it, much like bead blasting. Blasting with 10X leaves parts and surfaces looking brand new, and it all happens with lightning speed in one pass.

## [BLASTING PRESSURE]

### ✗ How can 10X abrasives survive and continue to increase in effectiveness at nozzle pressures of 120 PSI+? That doesn't seem possible.

- Every abrasive will begin to shatter upon surface impact as the pressure is raised above some threshold, which is unique to each abrasive depending on the toughness and friability of the particles. Harder abrasives tend to have higher pressure thresholds. Garnet and aluminum oxide have thresholds above about 110 PSI while slags and crushed glass are more brittle and begin to lose effectiveness at lower pressures. The amorphous, random molecular arrangement of superoxalloy particles, along with the fact that the particles are formed in a tempering process by rapid cooling of a high-temperature liquid melt, gives the 10X particles extra toughness and a significantly higher pressure threshold. Materials science explains why. Crystalline and semi-crystalline materials have fracture planes, or areas of weakness (see sidebar on page 5), along which the particles will tend to break and form dust. By virtue of their amorphous structure and tempering for additional material strength, 10X particles are uniformly strong throughout and can withstand higher impact forces before they begin to break down. The big news here for blasters is that you can go ahead and let it rip with 10X abrasives. Rest assured that your blasting efficiency will continue to improve all the way to 120 PSI and even higher. The increase in energy delivery and productivity can be astonishing. Get that pressure up if you can!

## [BLASTING PRESSURE]

### ✗ You recommend nozzle pressures of 100 PSI or more for 10X abrasives? Seems high. Why can't I run at lower pressure?

- You can run 10X superoxalloy abrasives at lower pressure, but you won't necessarily see the breakthrough in speed and effectiveness. We realize that sometimes a job simply requires lower pressure. Even then, you will always get that premium 10X finish. Having said that, it is an industry rule of thumb that about 1.5% of blasting efficiency is lost for every PSI of pressure below 100, regardless of the abrasive being used. There are three reasons we hear for not blasting above 100 PSI: 1) the abrasive gets dusty and loses effectiveness, 2) the compressor doesn't have the capacity to produce pressures above 100 PSI, or 3) it is much more work for blasters to hold the nozzle against the thrust produced above 100 PSI. The first is a non-issue with KinetiX and EpiX. We have previously explained how 10X abrasives make optimum use of the extra pressure. Resolving the second and third reasons is more involved, but it can be done, often with existing equipment or minor changes in equipment. The capacity of a compressor to produce pressure at the nozzle can be addressed through more efficient delivery of air to the pot and nozzle. The ability of the blaster to withstand higher pressures can be resolved by optimizing nozzle size and blasting technique. The great thing about blasting is that there are many "knobs" to turn in the overall system for improvements. 10X engineers love working through this process! You'll be amazed at the service you'll get.

# SUPEROXALLOY PROCESS IMPROVEMENT ABRASIVES AND 10X ENGINEERED MATERIALS

## [RUST BLOOM]

### ✗ How are superoxalloy abrasives able to delay rust bloom on steel, even when parts are left out in the rain?

- Believe it or not, rusting of clean, bare steel is a slow process. It can only happen quickly if there are iron-based or ionic (charged) residues like chlorides present on the surface to initiate the electrochemical corrosion reaction that forms iron oxide (rust). An all-too-common result from abrasive blasting with non-superoxalloy abrasives is the embedment of abrasive particles in the surface. Some particles become wedged in the anchor profile rather than bouncing off, particularly when particles become crushed upon impact with the surface. If the wedged abrasive particles contain iron compounds or water-soluble salts (which most non-superoxalloy abrasives do), flash rusting will start around those embedded particles in a matter of minutes or hours and spread from there. Because of the unique shape distribution of 10X superoxalloy abrasive particles and their ability to resist breaking, there is virtually no embedment in a finished surface. 10X leaves a truly clean surface with no residues left behind to initiate and accelerate rusting. This one feature streamlines inspections, eliminates costly rework, improves coating quality and performance life and provides greater flexibility in scheduling blast and paint operations.

## [CLEAN ABRASIVE]

### ✗ “Clean” is how you describe your abrasives. What does that mean?

- Cleanliness and safety are of paramount importance to us in everything we do, not just in the product. Veterans of the manufacturing and abrasives industries that visit our plant in Wabash, Indiana, remark that it is so clean that it looks like a food-grade operation. That's simply because all truly safe manufacturing operations are clean. The same standards of care and attention apply to everyone in our sphere of influence including our suppliers, shipping carriers, distribution partners and customers who use our products.

As far as the products go, clean means ultra-low dust, pristine finished surfaces and no harm to people and the environment. There are no crystalline domains in the material, let alone the regulated forms of crystalline free silica. There is no detectable beryllium, so it is not possible for 10X products to cause or contribute to violations of the current OSHA beryllium rule. Our Toxicity Characteristic Leaching Protocol (TCLP) is clean. The only heavy metal that is detectable in the TCLP analyses is barium—at a level so low that it is more than 400 times below the EPA limit. You will be able to see what clean means when you buy and use 10X abrasives.

## [CONSUMPTION]

### ✖ Why are 10X superoxalloy abrasives referred to as "ultra low-consumption?"

- There are three attributes of our superoxalloy abrasives that serve to decrease the amount of abrasive required for a job:
  - 1) We have previously described how the **amorphous structure and toughness** of superoxalloy particles allows for delivery of particle energy to the surface with much higher efficiency. This efficiency most definitely increases speed and productivity, but it also dramatically decreases abrasive consumption. Because a greater percentage of particles are delivering their energy and doing more work, you won't need nearly as much abrasive as you are used to needing to complete a single-pass job. Particle toughness also allows you to reuse the abrasive if you have the capability to reclaim it. Medium-grade KinetiX products can be reused 4 to 6 times and sometimes more depending on the project. EpiX is even more reusable and in some cases many times more reusable. We have customers reporting 12 or more turns of EpiX MP in powder-coating operations.
  - 2) The **unique shape distribution** of 10X abrasive products also contributes to the ultra low-consumption. The combination of angular and rounded particles creates a solid mixture that flows very well. This "flowability" makes it possible to achieve stable and steady flow through a pot metering valve that has been turned down, even to nearly closed. We work extensively with customers to make sure they take advantage of this feature by dialing in the best position on the metering valve. We have universally found that the valve needs to be dialed back significantly compared to competing abrasives to achieve best results. The results can be dramatic. A recent customer was able to rapidly blast epoxy-coated bridge beams at an abrasive feed rate of less than 2 lb/min. That's a 50 lb bag every 25 minutes!
  - 3) The **density** of 10X superoxalloy particles becomes an advantage when compared with more dense abrasives like garnet, aluminum oxide, staurolite or silicon carbide. Simply put, abrasives are used by volume and purchased by weight. If you fill a certain pot with 10X abrasives, there will be as many particles as a denser abrasive but 30-40% lower total weight. Even if the pot of 10X does the same amount of work as the other abrasives, the consumption can be lower by 20-40% because of the density difference alone. But that's not what we are seeing. We are seeing pots of 10X products accomplishing 30% to 100% more work on top of the density effect.

# SUPEROXALLOY PROCESS IMPROVEMENT ABRASIVES AND 10X ENGINEERED MATERIALS

## [SUPEROXALLOY]

### ✗ Superoxalloy sounds like a new term. Is it?

- Yes! Like every other scientific term, the word “superoxalloy” was created. Scientists and engineers often run into this when they discover a breakthrough. They create a new word because existing words fail to adequately describe the innovation. That’s the case here.

The 10X technical team worked for years discovering, describing and developing the engineering methods to extract, purify, manufacture and commercialize an all-new category of abrasive material. As the team discovered more about the material’s unique properties and abilities, it became clear no existing word could accurately describe it. So, borrowing from the disciplines of metallurgy and mineralogy they engineered the term “superoxalloy”—a composite of existing science terms alloy, superalloy and oxide.

Is superoxalloy a marketing term? No. It’s a scientific term—and one we purposely did not trademark or copyright. We offer it freely to industry and the scientific community to foster interest in further study and development of this all-new category of abrasive material.

## [ABOUT US]

### ✗ Who is 10X Engineered Materials?

- 10X Engineered Materials is a science-based manufacturer of abrasive products. It was founded by a team of business and technical people from the fields of engineering, chemistry, materials science and abrasives technology. The company’s first innovation—superoxalloy abrasives—entered the commercial blasting and surface preparation markets for pilot testing in 2018. 10X Engineered Materials also completed patent submission for superoxalloy abrasive innovations in 2018. Today, the company’s two product lines, KinetiX and EpiX, are in commercial use in a wide range of applications that include everything from highly specialized device manufacturing with EpiX to railcar, tank and ship maintenance with KinetiX.

## [ABOUT OUR NAME]

### ✗ Why 10X? Where did the name come from?

- The founders of 10X Engineered Materials are mostly engineers and scientists that have spent their careers conceiving new ideas and commercializing new technologies to improve things, even old and stale technologies like cooling cycles or water filtration. In that world, 10X is a sort of the holy grail for quantum-leap improvement that innovators aspire to. When we uncovered superoxalloy abrasive technology and set out to commercialize it, we named the company in that spirit of always thinking big and striving for truly disruptive positive impact. From the start, our goal has been to develop an abrasive and a company 10 times (10X) better than anything else, and while this may be a stretch, we’ll do our best to try!

# 10X ENGINEERED MATERIALS

## ABOUT THE TEAM BEHIND THE BREAKTHROUGH

### US

Can a new company with an all-new class of abrasives help boost the surface preparation industry to all-new levels of productivity and skill?

That's our mission.

Three principles underpinned the effort, and still do.

Commitments to...

**Innovation:** based in sound science and engineering

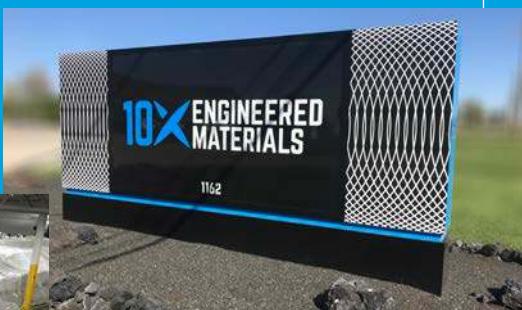
**Performance improvement:** centered on productivity, efficiency and output quality for our customers

**People:** upholding the health, safety and environment of those who use, distribute and make our products

With the introduction of KinetiX and EpiX superoxalloy abrasives, some would say the initial challenge has been met. But what about the mission? Accomplished? Not yet. There's plenty of work left to do.

To customers, colleagues and partners who've joined in, helped and inspired us on this mission, we say, thank you. And here's to the next breakthrough....

### THE 10X TEAM



10X clean-tech manufacturing facility in Wabash, Indiana



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