

MCD	MCD Apatitic Abrasive	ATCP	Alpha-tricalcium phosphate
MCHA	Hydroxyapatite (MC-Type)	SSBTCP	Beta-tricalcium phosphate SOLID-STATE SINTERED
SWHA	Hydroxyapatite SINTERED	SWBTCP	Beta-tricalcium phosphate SINTERED
UWHA	Hydroxyapatite UNSINTERED	UTCP	Tricalcium phosphate UNSINTERED
HAWHISK-S	Hydroxyapatite Whiskers	TTCP	Tetracalcium phosphate
CAD	Calcium Deficient HA Discs	S1BCP	Biphasic calcium phosphate SINTERED
HAD	Dense HA Discs	U1BCP	Biphasic calcium phosphate UNSINTERED
HADEL	Enamel-like HA Discs		



himed



MCD Apatitic Abrasive

Our MCD Apatitic Abrasive is a granular, multi-phase calcium phosphate (principally composed of hydroxyapatite and tricalcium phosphate) that is specially made to be as hard as possible. When MCD is used to abrasive blast titanium and titanium alloy implants it creates a virtually residue free, textured surface after passivation per ASTM F86. MCD is a free-flowing granular abrasive and is available in a range of standard particle sizes up to 425 µm.

MCD Apatitic Abrasive is one part of the MATRIX® line that is specially designed for the treatment of titanium implant devices.



Pictured: Sample of MCD Apatitic Abrasive with a size range of 425-180 µm (Himed Cat#MCD160). See additional pages for more product properties and particle size options.



MCD Apatitic Abrasive

Description

Apatitic abrasive, biphasic calcium phosphate of hydroxyapatite (HA), and beta-tricalcium phosphate (b-TCP)

Physical Properties

Appearance	White, free flowing, granular abrasive powder with blue-green tint, and an irregular particle shape
Roughness	$\geq 3.05 \mu\text{m Ra}$ - for Ti-64 ¹

Chemical Properties

Chemical Formula	$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ and $\text{Ca}_3(\text{PO}_4)_2$
Synonyms	hydroxylapatite, calcium phosphate, tricalcium phosphate

Composition¹

Hydroxyapatite	$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$	$\geq 70\%$
Alpha-tricalcium phosphate	$\text{Ca}_3(\text{PO}_4)_2$	
Beta-tricalcium phosphate	$\text{Ca}_3(\text{PO}_4)_2$	$\leq 25\%$
Tetracalcium phosphate	$\text{Ca}_4\text{P}_2\text{O}_9$	
Other Ca-P phases		$\leq 5\%$

Trace Elements Conforms to ASTM F1185

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





MCD Apatitic Abrasive

Particle Sizes²

CATALOG #	SIZE RANGE	ACCEPTABLE RANGE
MCD180	425-250 µm	≥ 85%
MCD160	425-180 µm	≥ 90%
MCD140	300-180 µm	≥ 80%
MCD120	< 300 µm	≥ 95%
MCD100	< 180 µm	≥ 95%
MCD20	< 53 µm	≥ 95%

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Additional sizes are available upon request.



Related Processes



Biocompatible grit-blasting technique for refining surface Ti implant topography



Nuanced surface texturing of complex Ti implants optimized for osseointegration

Notes

1. Measured using MCD160 and Himed internal protocol WI-0010
2. Measured using Himed internal protocol WI-0009



SOLID-STATE SINTERED Hydroxyapatite (MC-type HA)

Hydroxyapatite (HA) is similar to the mineral found in bone, and it is one of the biomaterials used for bone repair in synthetic bone grafts and bone cements. It has found use as a chromatography medium for separating certain kinds of proteins and other compounds. It can be made into a coating for enhancing the performance of ortho, dental, spinal and other implants.

MC-type HA is produced by a solid state manufacturing process which creates a powder with irregular shaped granules. MC-type HA is specifically designed for plasma spray coating applications as part of Himed's MATRIX® coating system.



Pictured: Sample of solid-state sintered MC-type HA with a size range of < 53 µm (Himed Cat#MCHA20). See additional pages for more product properties and particle size options.



SOLID-STATE SINTERED Hydroxyapatite (MC-type HA)

Description

A white sintered powder/granular powder with irregular shape (from solid-state process)

Physical Properties

Appearance White powder, granular

Other Category 3.12 ± 0.08 g/cc
(by gas pycnometry)

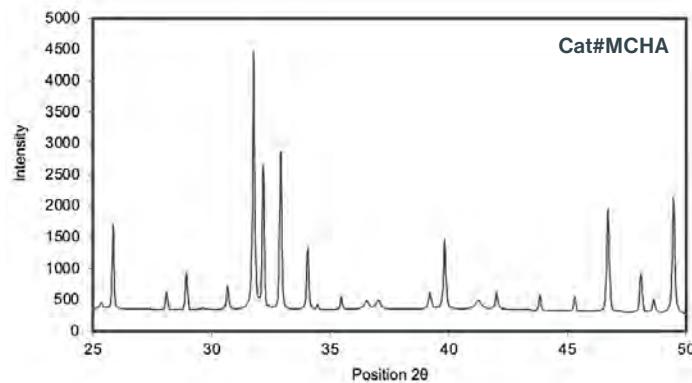
Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, bone mineral

Composition

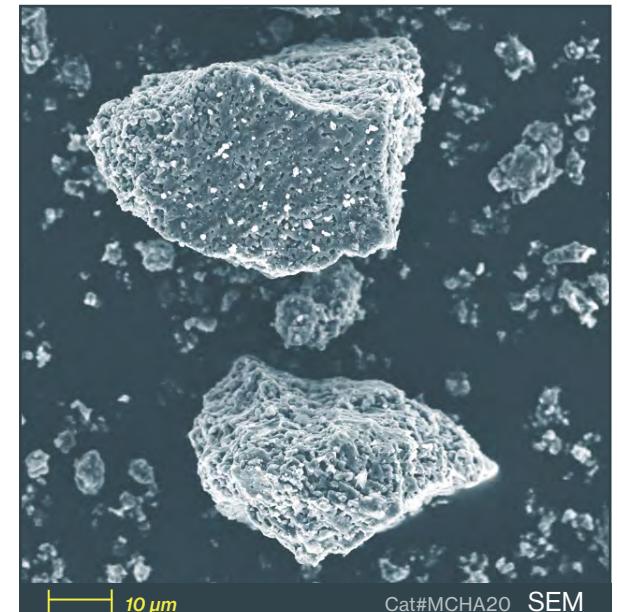
Hydroxyapatite $\geq 96\%$ **Other Ca-P phases** $\leq 4\%$ (by XRD)



Trace Elements Conforms to ASTM F1185

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

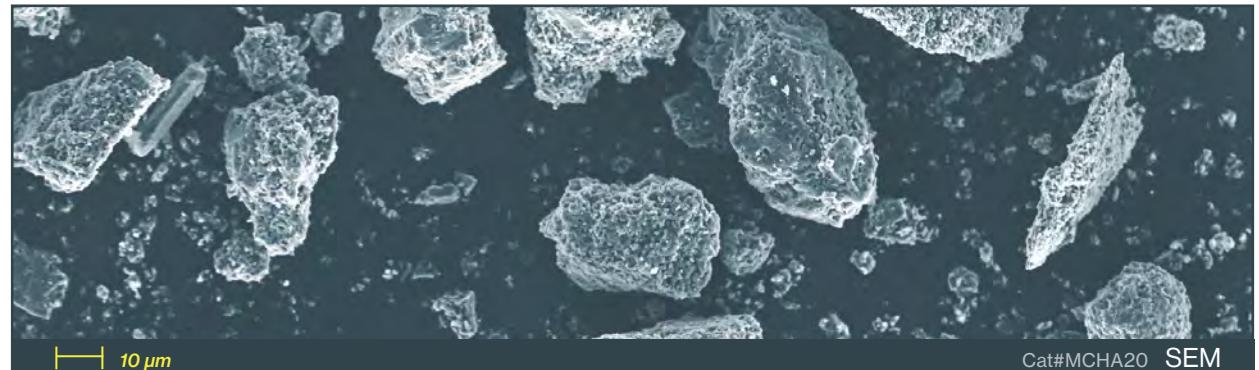
(by ICP)





SOLID-STATE SINTERED Hydroxyapatite (MC-type HA)

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).



Particle Sizes

CATALOG #	SIZE RANGE	ACCEPTABLE RANGE
MCHA15	20-63 μm	$< 20 \mu\text{m} \geq 15$ to 25% $20-63 \mu\text{m} \geq 70\%$ <i>by sieve analysis</i> $> 63 \mu\text{m} \leq 5\%$
MCHA10	$< 20 \mu\text{m}$	$< 20 \mu\text{m} \geq 84\%$ $> 20 \mu\text{m} \leq 16\%$ <i>by laser diffraction</i>

Additional sizes are available upon request.

Related Products

UWHA: Hydroxyapatite, precipitated + unsintered

SWHA: Hydroxyapatite, precipitated + sintered

Related Processes



Atmospheric plasma spray system that applies a dense coating of hydroxyapatite on virtually residue-free MCD grit-blasted medical implants.



PRECIPITATED + SINTERED Hydroxyapatite (HA)

Hydroxyapatite (HA) is similar to the mineral found in bone, and it is one of the biomaterials used for bone repair in synthetic bone grafts and bone cements. It has found use as a chromatography medium for separating certain kinds of proteins and other compounds. It can be made into a coating for enhancing the performance of ortho, dental, spinal and other implants.



Pictured: Sample of precipitated and sintered HA with a size range of < 53 µm (Himed Cat#SWHA20). See additional pages for more product properties and particle size options.



PRECIPITATED + SINTERED Hydroxyapatite (HA)

Description

A sintered hydroxyapatite (HA) powder by precipitation process

Physical Properties

Appearance White powder

Other Category 3.15 ± 0.10 g/cc
(by gas pycnometry)

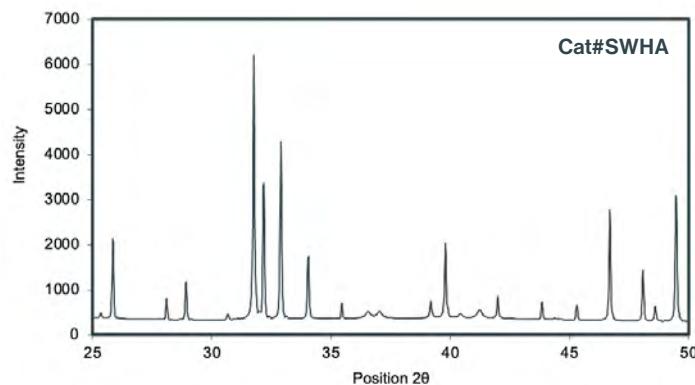
Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, bone mineral

Composition

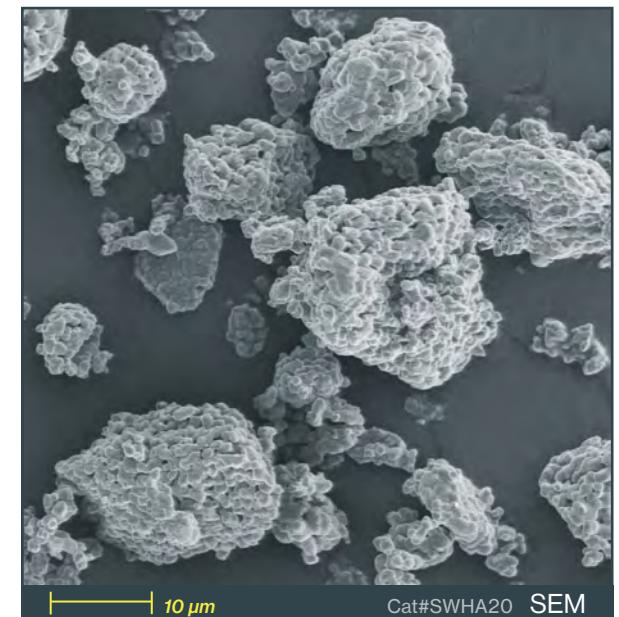
Hydroxyapatite $\geq 96\%$ **Other Ca-P phases** $\leq 4\%$ (by XRD)



Trace Elements Conforms to ASTM F1185

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





**PRECIPITATED + SINTERED
Hydroxyapatite (HA)**



Particle Sizes

CATALOG #	SIZE RANGE
SWHA60	500-1000 µm
SWHA50	250-500 µm
SWHA30	100-300 µm
SWHA25	53-124 µm
SWHA20	< 53 µm
SWHA13	< 10 µm - jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

UWHA: Hydroxyapatite, precipitated + unsintered

MCHA: Hydroxyapatite, solid-state sintered



PRECIPITATED + UNSINTERED Hydroxyapatite (HA)

Hydroxyapatite (HA) is similar to the mineral found in bone, and it is one of the biomaterials used for bone repair in synthetic bone grafts and bone cements.

Unsintered hydroxyapatite is a poorly crystallized calcium phosphate that becomes highly crystallized HA when sintered. It can be used to make strong porous solids and granules by adding a porogenic substance prior to sintering.



Pictured: Sample of precipitated and unsintered HA with a size range of < 53 µm (Himed Cat#UWHA20). See additional pages for more product properties and particle size options.



PRECIPITATED + UNSINTERED Hydroxyapatite (HA)

Description

An unsintered precipitated powder

Physical Properties

Appearance White powder

Other Category 3.1 ± 0.1 g/cc
(by pycnometry)

Chemical Properties

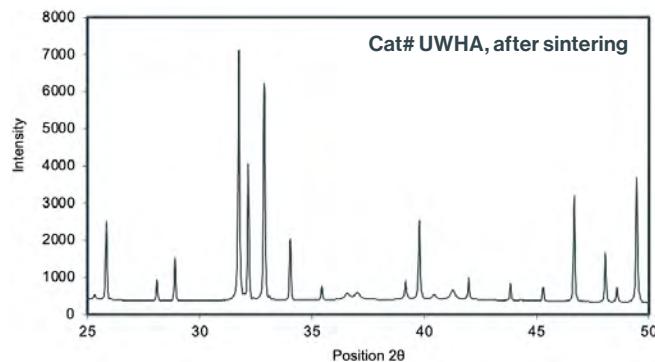
Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, bone mineral

Composition

Low crystallinity calcium phosphate apatite at unsintered condition
High crystallinity after sintering at 1000-1150°C

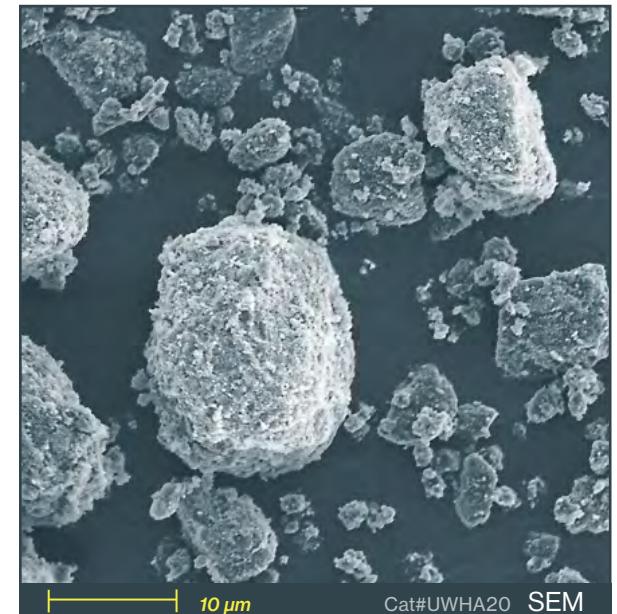
Hydroxyapatite $\geq 98\%$ (by XRD)
Other Ca-P phases $\leq 2\%$



Trace Elements Conforms to ASTM F1185

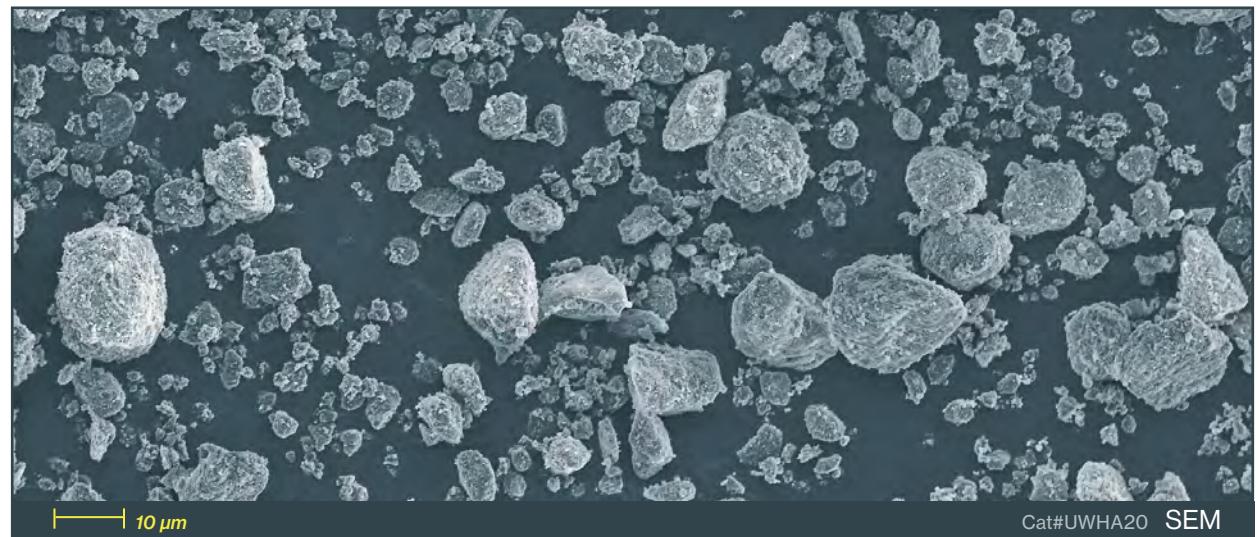
Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





PRECIPITATED + UNSINTERED Hydroxyapatite (HA)



Particle Sizes

CATALOG #	SIZE RANGE
UWHA50	250-500 μm
UWHA30	100-300 μm
UWHA20	< 53 μm
UWHA13	< 10 μm - jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

SWHA: Hydroxyapatite, precipitated + sintered

MCHA: Hydroxyapatite, solid-state sintered



Hydroxyapatite (HA) Whiskers

Hydroxyapatite (HA) is a highly crystalline form of calcium phosphate that is similar to the mineral found in bone. It is commonly used for bone repair in synthetic bone grafts, bone void fillers and bone cements.

Himed has developed a process to manufacture pure hydroxyapatite rod-like particles with a high aspect ratio (length/diameter). These Hydroxyapatite Whiskers have the appearance of white powder, but under magnification they are actually transparent, as each whisker is a single crystal of hydroxyapatite.

The unique shape of the HA Whiskers may be useful in composite materials to add strength in addition to bioactivity for orthopedic applications.



*Pictured: Sample of HA Whiskers
(Himed Cat#HAWHISK-S).
See additional pages for
more product properties.*



Hydroxyapatite (HA) Whiskers

Description

Rod-shaped hydroxyapatite (HA) crystals

Physical Properties

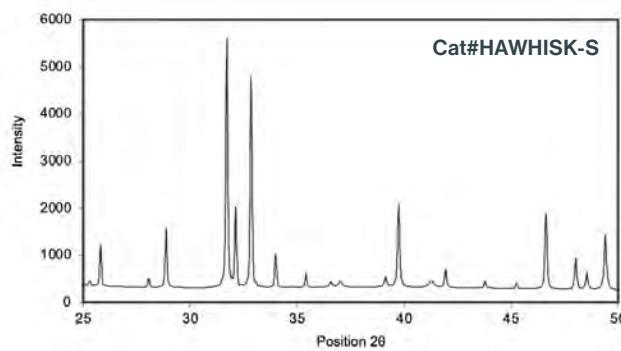
Appearance	Rod-like particles
Color	Transparent under optical magnification
Rod Shaped Population	> 80% by area ¹
Diameter	≤ 10 µm
Aspect Ratio (length/diameter)	3/1 to 10/1
Density	3.16 ± 0.10 g/cc ¹

Chemical Properties

Chemical Formula	$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$
Synonyms	hydroxylapatite bone mineral calcium phosphate

Composition

Hydroxyapatite ≥ 95% Other Ca-P phases ≤ 5% (by XRD)



Trace Elements
Conforms to ASTM F1185 (by ICP)

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm





Hydroxyapatite (HA) Whiskers



Related Products

MCHA: Hydroxyapatite, solid-state sintered

SWHA: Hydroxyapatite, precipitated + sintered

UWHA: Hydroxyapatite, precipitated + unsintered

Notes

1. Determined using Himed internal protocol WI-0095

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).



Calcium Deficient Hydroxyapatite (HA) Discs

Himed makes hydroxyapatite (HA) discs in a variety of sizes for use as laboratory substrates. They are available in dense HA, calcium deficient HA and enamel-like HA.

Calcium deficient HA discs are unsintered and have been used to grow cells and bacteria for *in vitro* assays. These discs may also be used as sputtering targets.



Pictured: Calcium deficient hydroxyapatite (HA) discs 9.5 mm in diameter (Himed Cat#CAD35). See additional pages for more product properties and disc size options.

Hydroxyapatite (HA) Disc Comparisons

	ENAMEL-LIKE HA DISC	DENSE HA DISC	CALCIUM DEFICIENT HA DISC
Catalog#	HADEL	HAD	CAD
Bulk Density	3.11 g/cc	2.8 g/cc	1.6 g/cc
Thermal Treatment	sintered	sintered	unsintered
Appearance	translucent, smooth surface	opaque, softer than enamel-like discs	white, soft



Calcium Deficient Hydroxyapatite (HA) Discs

Description

Unsintered white solid discs

Physical Properties

Appearance White solid discs

Bulk Density 1.6 ± 0.2 g/cc

Specific Density 3.0 ± 0.2 g/cc
(by gas pycnometry)

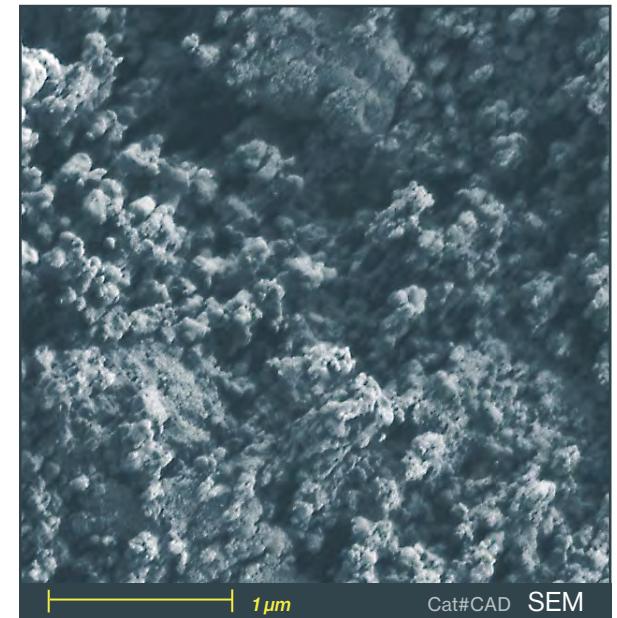
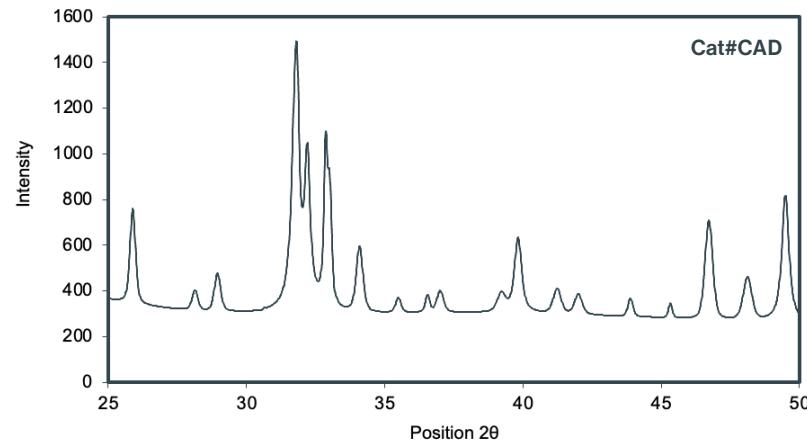
Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, bone mineral

Composition

Hydroxyapatite $\geq 95\%$ Other Ca-P phases $\leq 5\%$ (by XRD)





Calcium Deficient Hydroxyapatite (HA) Discs



Disc Sizes

CATALOG #	SIZE RANGE	TYPICAL RANGE
CAD35	9.5 mm diameter x 1.8 mm thick	$d \pm 0.3 \text{ mm}, t \pm 0.2 \text{ mm}$
CAD30	5.0 mm diameter x 2.0 mm thick	$d \pm 0.3 \text{ mm}, t \pm 0.2 \text{ mm}$
CAD25	1.0 inch diameter x 0.1 inch thick	$d \pm 0.02 \text{ inch}, t \pm 0.01 \text{ inch}$
CAD20	0.5 inch diameter x 0.05 inch thick	$d \pm 0.02 \text{ inch}, t \pm 0.01 \text{ inch}$

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

HAD: Dense hydroxyapatite discs

HADEL: Enamel-like hydroxyapatite discs



Dense Hydroxyapatite (HA) Discs

Himed makes hydroxyapatite (HA) discs in a variety of sizes for use as laboratory substrates. They are available in dense HA, calcium deficient HA and enamel-like HA.

Dense HA discs are sintered and have been used to grow cells and bacteria for *in vitro* assays. These discs may also be used as sputtering targets.



Pictured: Dense hydroxyapatite (HA) discs 12.7 mm in diameter (Himed Cat#HAD70). See additional pages for more product properties and disc size options.

Hydroxyapatite (HA) Disc Comparisons

	ENAMEL-LIKE HA DISC	DENSE HA DISC	CALCIUM DEFICIENT HA DISC
Catalog#	HADEL	HAD	CAD
Bulk Density	3.11 g/cc	2.8 g/cc	1.6 g/cc
Thermal Treatment	sintered	sintered	unsintered
Appearance	translucent, smooth surface	opaque, softer than enamel-like discs	white, soft



Dense Hydroxyapatite (HA) Discs

Description

Sintered white solid discs

Physical Properties

Appearance White solid discs

Bulk Density 2.8 ± 0.2 g/cc

Specific Density 3.1 ± 0.1 g/cc
(by gas pycnometry)

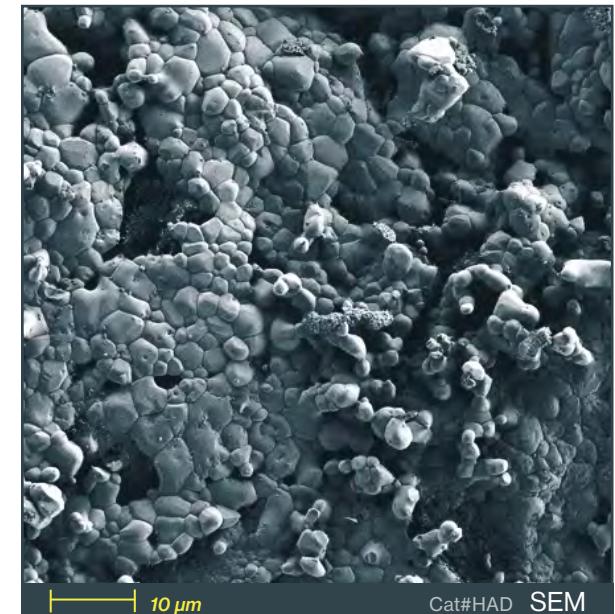
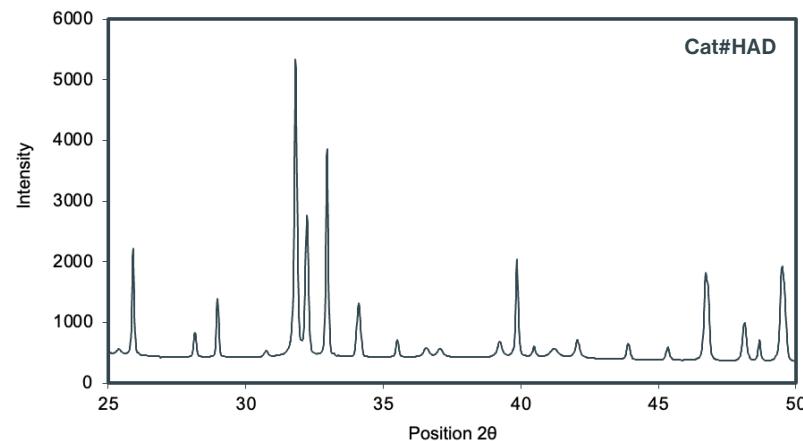
Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, bone mineral

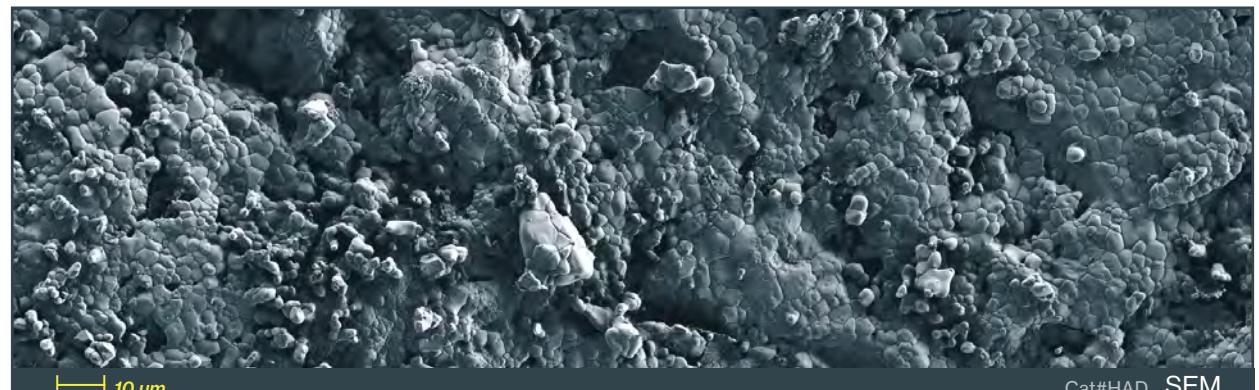
Composition

Hydroxyapatite $\geq 95\%$ **Other Ca-P phases** $\leq 5\%$ (by XRD)





Dense Hydroxyapatite (HA) Discs



Disc Sizes

CATALOG #	SIZE RANGE	TYPICAL RANGE
HAD70	12.7 mm diameter x 1.8 mm thick	d \pm 0.3 mm, t \pm 0.2 mm
HAD65	9.5 mm diameter x 1.8 mm thick	d \pm 0.3 mm, t \pm 0.2 mm
HAD50	7.0 mm diameter x 1.8 mm thick	d \pm 0.3 mm, t \pm 0.2 mm
HAD40	5.0 mm diameter x 1.8 mm thick	d \pm 0.3 mm, t \pm 0.2 mm
HAD15	0.5 inch diameter x 0.05 inch thick	d \pm 0.02 inch, t \pm 0.01 inch

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

CAD: Calcium deficient hydroxyapatite discs

HADEL: Enamel-like hydroxyapatite discs



Pictured: Enamel-like hydroxyapatite (HA) discs 12.1 mm in diameter (Himed Cat#HADEL02). See additional pages for more product properties and disc size options.

Enamel-like Hydroxyapatite (HA) Discs

Himed makes hydroxyapatite (HA) discs in a variety of sizes for use as laboratory substrates. They are available in dense HA, calcium deficient HA and enamel-like HA.

Enamel-like HA discs are translucent and have a smooth surface that is similar to dental enamel and a bulk density close to the theoretical density of HA. They have been used to grow cells, bacteria, and plaque for *in vitro* assays, and to test anti-bacterial and antiplaque agents. They have also been stained to test whitening agents and toothpastes.

Hydroxyapatite (HA) Disc Comparisons

	ENAMEL-LIKE HA DISC	DENSE HA DISC	CALCIUM DEFICIENT HA DISC
Catalog#	HADEL	HAD	CAD
Bulk Density	3.11 g/cc	2.8 g/cc	1.6 g/cc
Thermal Treatment	sintered	sintered	unsintered
Appearance	translucent, smooth surface	opaque, softer than enamel-like discs	white, soft



Enamel-like Hydroxyapatite (HA) Discs

Description

Enamel-like white translucent discs

Physical Properties

Appearance White translucent discs

Bulk Density 3.11 ± 0.05 g/cc

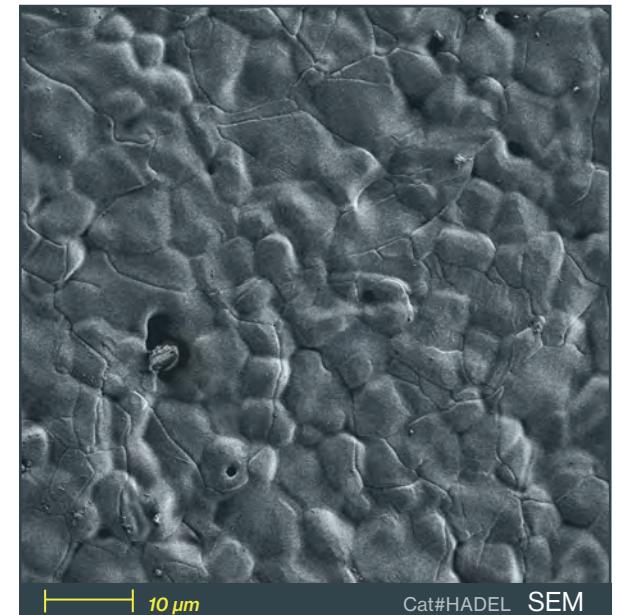
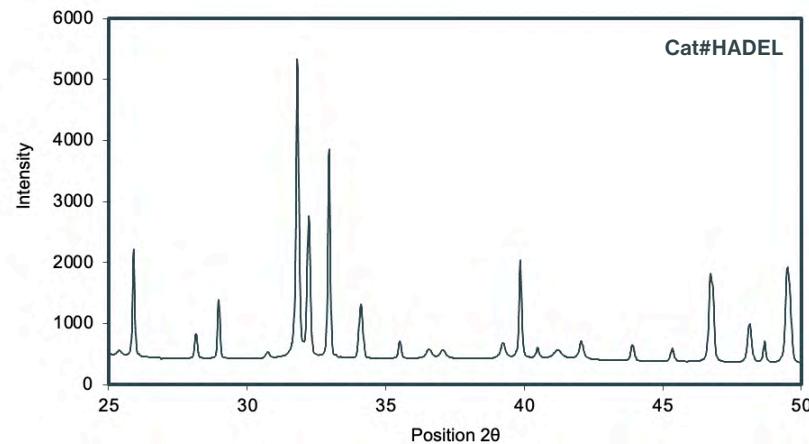
Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

Synonyms hydroxylapatite, calcium phosphate, dental enamel

Composition

Hydroxyapatite $\geq 95\%$ **Other Ca-P phases** $< 5\%$ (by XRD)





Enamel-like Hydroxyapatite (HA) Discs



2 μ m

Cat#HADEL SEM

Disc Sizes

CATALOG #	SIZE RANGE	TOLERANCE
HADEL02	12.1 mm diameter x 2.3 mm thick	d \pm 0.5 mm, t \pm 0.3 mm
HADEL03	20.7 mm diameter x 2.1 mm thick	d \pm 0.7 mm, t \pm 0.4 mm
HADEL04	16.6 mm diameter x 2.1 mm thick	d \pm 0.5 mm, t \pm 0.3 mm
HADEL22	22.9 mm diameter x 2.1 mm thick	d \pm 0.7 mm, t \pm 0.5 mm
HADEL30	30.6 mm diameter x 2.8 mm thick	d \pm 1.0 mm, t \pm 0.5 mm

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

HAD: Dense hydroxyapatite discs

CAD: Calcium deficient hydroxyapatite discs



Alpha-tricalcium phosphate (a-TCP)

This calcium phosphate compound is more soluble and reactive than hydroxyapatite (HA) and beta-tricalcium phosphate (b-TCP), but less than amorphous calcium phosphate (ACP) and tetracalcium phosphate (TTCP). Alpha-tricalcium phosphate (a-TCP) has found use for bone repair as a component of bone cements.

Alpha-tricalcium phosphate is formed through a precipitation process and is sintered to create a highly crystalline powder.



Pictured: Sample of a-TCP with a size range of < 53 µm (Himed Cat#ATCP20). See additional pages for more product properties and particle size options.



Alpha-tricalcium phosphate (a-TCP)

Description

A white sintered powder/granular with irregular shape (from precipitated process)

Physical Properties

Appearance White powder with tint grey

Specific Density $2.86 \pm 0.10 \text{ g/cc}$
(by gas pycnometry)

Chemical Properties

Chemical Formula $\text{Ca}_3(\text{PO}_4)_2$

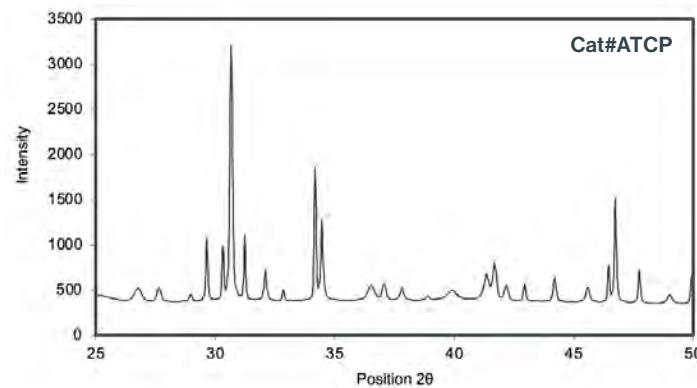
Synonyms a-TCP
α-TCP
tribasic calcium phosphate

Composition

Alpha-tricalcium phosphate $\geq 95\%$

Other Ca-P phases $\leq 5\%$

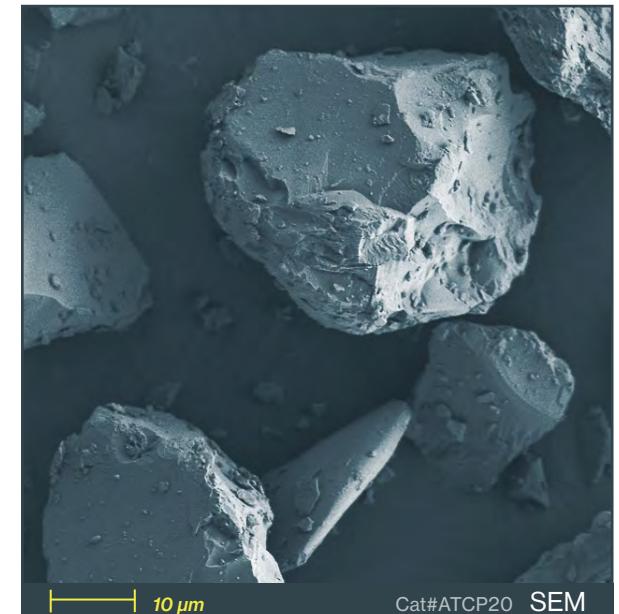
(by XRD)



Trace Elements

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





Alpha-tricalcium phosphate (a-TCP)



Particle Sizes

CATALOG #	SIZE RANGE
ATCP20	< 53 μm
ATCP13	< 10 μm – jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

SSBTCP: Beta-tricalcium phosphate, solid-state sintered

SSWBTCP: Beta-tricalcium phosphate, precipitated + sintered

UTCP: Tricalcium phosphate, precipitated + unsintered



SOLID-STATE SINTERED Beta-tricalcium phosphate (b-TCP)

This calcium phosphate compound is more soluble and reactive than hydroxyapatite (HA) but less than amorphous calcium phosphate (ACP) and tetracalcium phosphate (TTCP). Beta-TCP has found use in synthetic bone grafts and scaffolds for tissue engineering for bone regeneration. It is also used as components of CaP/polymer composite implants and bone screws.

SSBTCP is formed through a solid state sintering process to produce a highly crystalline powder.



Pictured: Sample of solid-state sintered b-TCP with a size range of < 53 µm (Himed Cat#SSBTCP20). See additional pages for more product properties and particle size options.



SOLID-STATE SINTERED Beta-tricalcium phosphate (b-TCP)

Description

A white sintered powder/granular with irregular shape (from solid state process)

Physical Properties

Appearance White granular powder

Other Category $3.08 \pm 0.10 \text{ g/cc}$
(by gas pycnometry)

Chemical Properties

Chemical Formula $\text{Ca}_3(\text{PO}_4)_2$

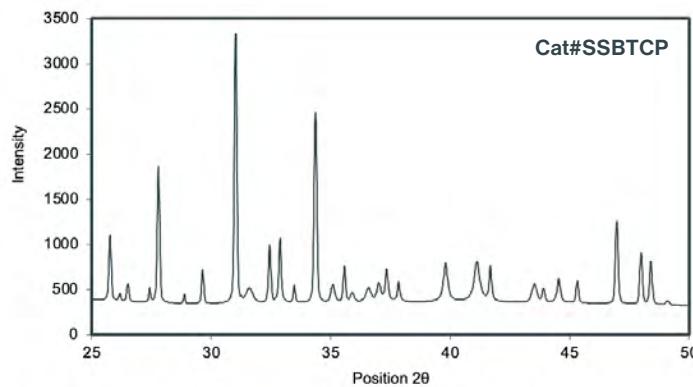
Synonyms Tribasic calcium phosphate
b-TCP
 β -TCP

Composition

Beta-tricalcium phosphate $\geq 96\%$

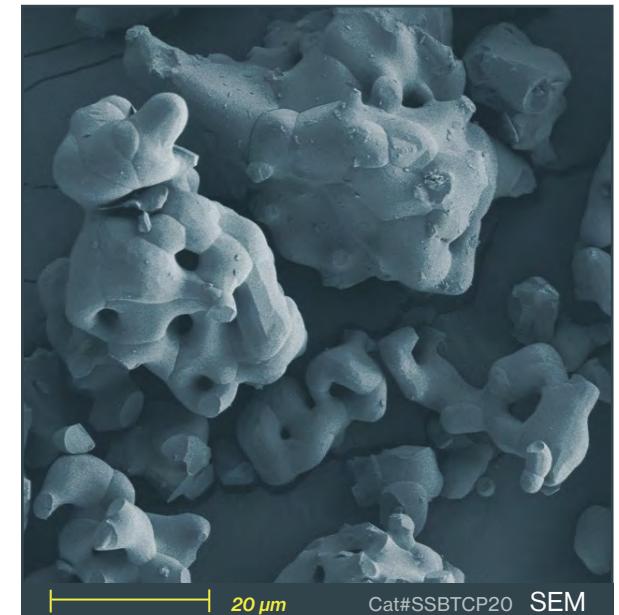
Other Ca-P phases $\leq 4\%$

(by XRD)



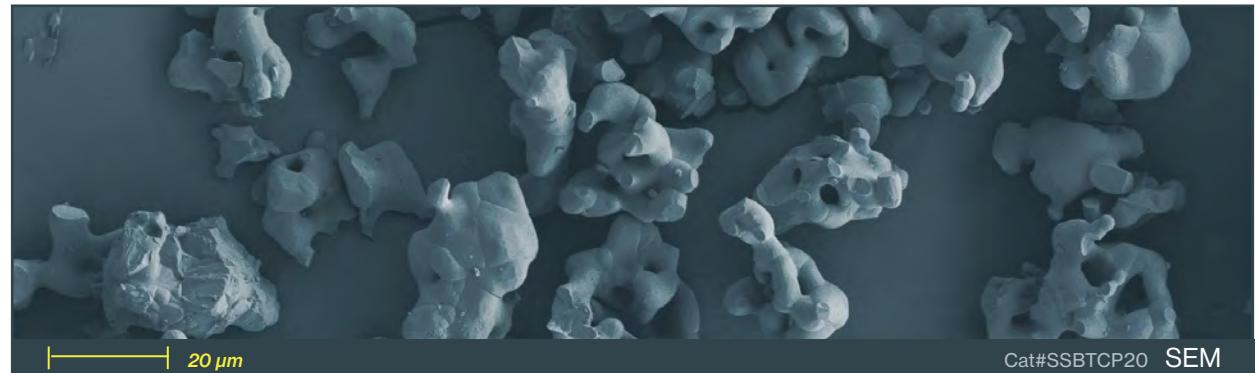
Trace Elements

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm





SOLID-STATE SINTERED Beta-tricalcium phosphate (b-TCP)



Particle Sizes

CATALOG #	SIZE RANGE
SSBTCP30	100-300 μm
SSBTCP24	53-106 μm
SSBTCP15	20-63 μm
SSBTCP20	< 53 μm
SSBTCP43	5-30 μm
SSBTCP13	< 10 μm – jet milled
SSBTCP14	< 5 μm – jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

SWBTCP: Beta-tricalcium phosphate, precipitated + sintered

UTCP: Tricalcium phosphate, precipitated + unsintered



PRECIPITATED + SINTERED
Beta-tricalcium phosphate (b-TCP)

This calcium phosphate compound is more soluble and reactive than hydroxyapatite (HA) but less than amorphous calcium phosphate (ACP) and tetracalcium phosphate (TTCP). Beta-TCP has found use in synthetic bone grafts and scaffolds for tissue engineering for bone regeneration. It is also used as components of CaP/polymer composite implants and bone screws.

SWBTCP is formed through a precipitation process and is sintered to create a highly crystalline powder. Powders formed through precipitation are generally more active and can be used for a wider range of applications than those formed through solid-state processes.



Pictured: Sample of precipitated and sintered b-TCP with a size range of < 53 µm (Himed Cat#SWBTCP20). See additional pages for more product properties and particle size options.



PRECIPITATED + SINTERED Beta-tricalcium phosphate (b-TCP)

Description

A white sintered powder/granular powder with irregular shape (from a precipitation process)

Physical Properties

Appearance	White granular powder
Specific Density	3.08 ± 0.10 g/cc <i>(by gas pycnometry)</i>

Chemical Properties

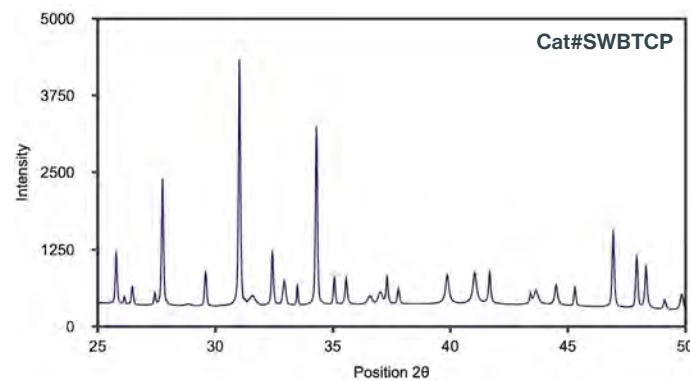
Chemical Formula	$\text{Ca}_3(\text{PO}_4)_2$
Synonyms	b-TCP β -TCP tribasic calcium phosphate

Composition

Beta-tricalcium phosphate $\geq 96\%$

Other Ca-P phases $\leq 4\%$

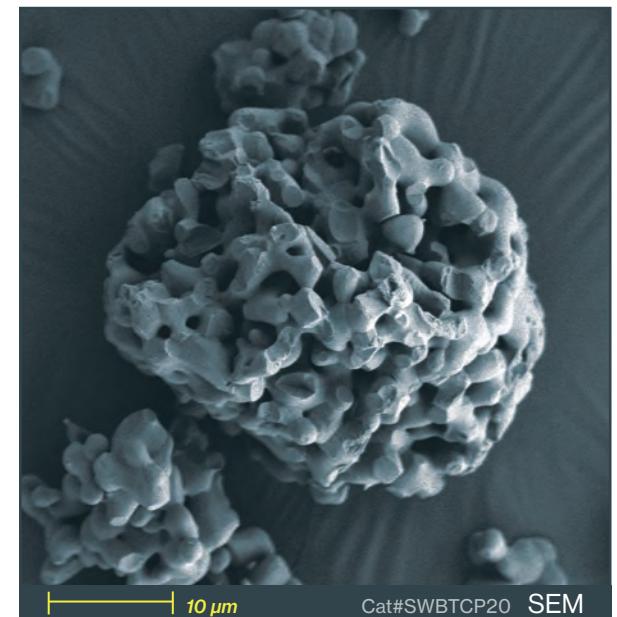
(by XRD)



Trace Elements

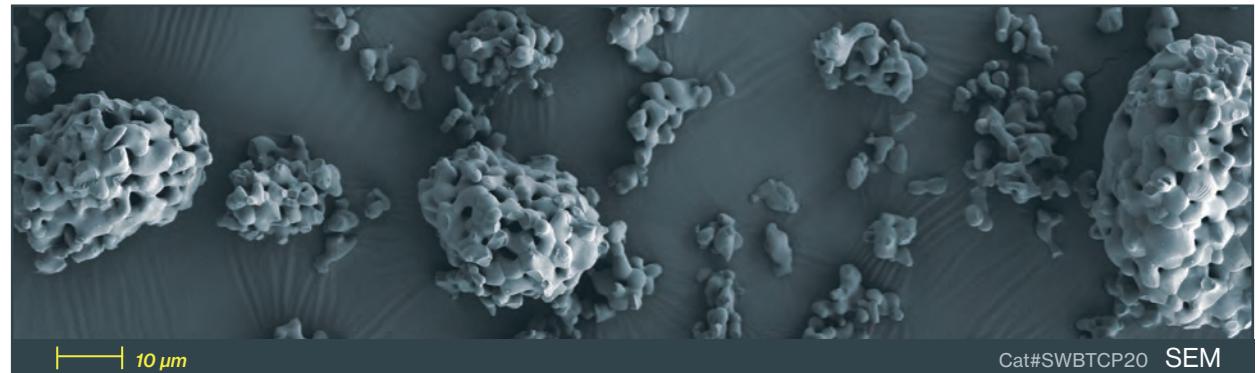
Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





PRECIPITATED + SINTERED
Beta-tricalcium phosphate (b-TCP)



Particle Sizes

CATALOG #	SIZE RANGE	
SWBTCP60	500-1000 μm	
SWBTCP50	250-500 μm	
SWBTCP30	100-300 μm	$\geq 80\%$ within range by sieve analysis
SWBTCP25	53-124 μm	
SWBTCP20	< 53 μm	
SWBTCP13	< 10 μm – jet milled	D90 by laser particle size analysis
SWBTCP14	< 5 μm – jet milled	

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

SSBTCP: Beta-tricalcium phosphate, solid-state sintered

UTCP: Tricalcium phosphate, precipitated + unsintered



PRECIPITATED + UNSINTERED Tricalcium phosphate (TCP)

This calcium phosphate compound is more soluble and reactive than hydroxyapatite (HA) but less than amorphous calcium phosphate (ACP) and tetracalcium phosphate (TTCP). Beta-TCP has found use in synthetic bone grafts and scaffolds for tissue engineering for bone regeneration. It is also used as components of CaP/polymer composite implants and bone screws.

UTCP is formed through a precipitation process to produce and is unsintered. Upon sintering it forms a highly crystalline powder of b-TCP, and thus it can be used to form a variety of shapes and structures after sintering.



Pictured: Sample of precipitated and unsintered TCP with a size range of < 53 µm (Himed Cat#UTCP20). See additional pages for more product properties and particle size options.



PRECIPITATED + UNSINTERED Tricalcium phosphate (TCP)

Description

A white unsintered powder/granular with irregular shape (from precipitated process)

Physical Properties

Appearance White granular powder

Chemical Properties

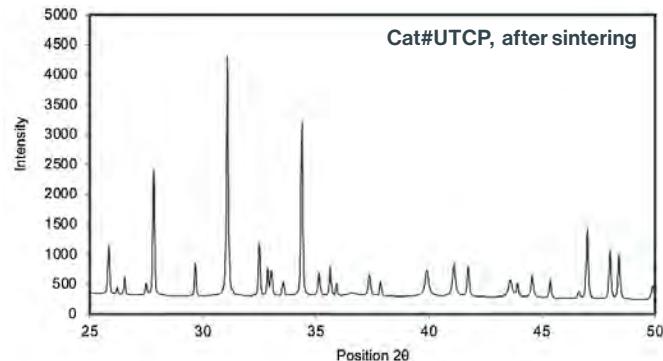
Chemical Formula $\text{Ca}_3(\text{PO}_4)_2$

Synonyms tribasic calcium phosphate
b-TCP
 β -TCP

Composition

Low crystallinity calcium phosphate apatite at unsintered condition
High crystallinity after sintering at 1000-1150°C

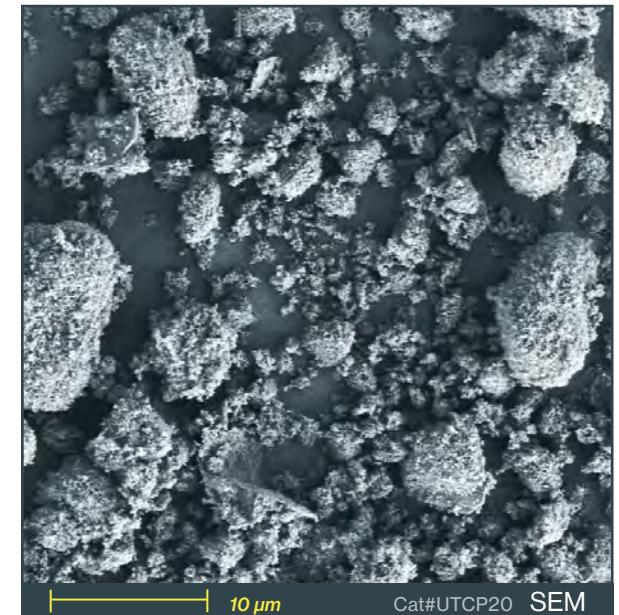
Beta-tricalcium phosphate $\geq 98\%$ (by XRD)
Other Ca-P phases $\leq 2\%$



Trace Elements

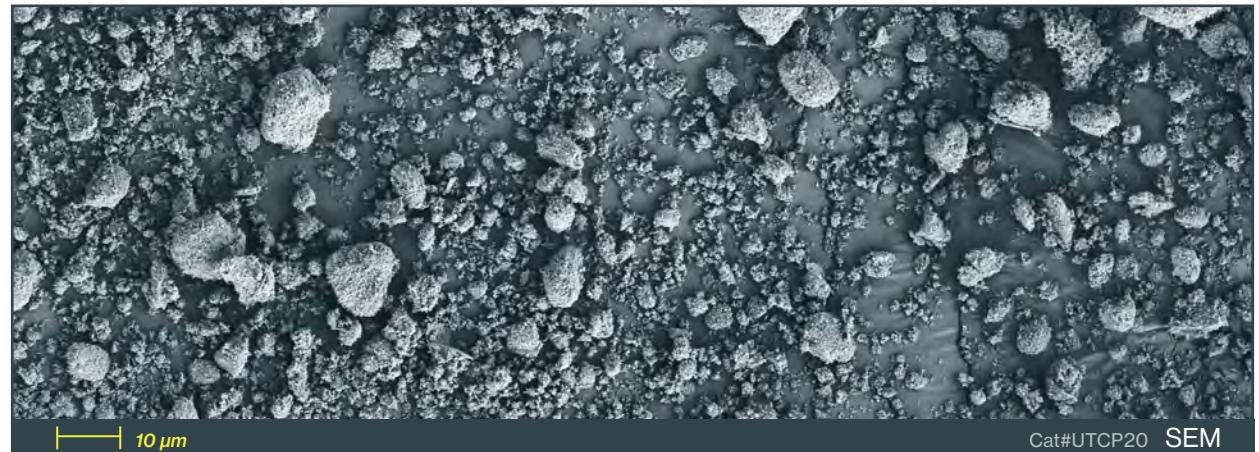
Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





PRECIPITATED + UNSINTERED
Tricalcium phosphate (TCP)



Particle Sizes

CATALOG #	SIZE RANGE
UTCP50	250-500 μm
UTCP30	100-300 μm
UTCP20	< 53 μm
UTCP13	< 10 μm – jet milled
UTCP14	< 5 μm – jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

SWBTCP: Beta-tricalcium phosphate, precipitated + sintered

SSBTCP: Beta-tricalcium phosphate, solid-state sintered



Tetracalcium phosphate (TTCP)

This calcium phosphate biomaterial is very soluble and reactive, more so than hydroxyapatite (HA) and beta-tricalcium phosphate (β -TCP), but less than amorphous calcium phosphate (ACP) and alpha-tricalcium phosphate (α -TCP). Tetracalcium phosphate (TTCP) has found use for bone repair as a component of bone cements. It has also been used in chewing gum to remineralize teeth.



Pictured: Sample of TTCP with a size range of < 53 μm (Himed Cat#TTCP20). See additional pages for more product properties and particle size options.



Tetracalcium phosphate (TTCP)

Description

A sintered powder with a tint of blue or grey color

Physical Properties

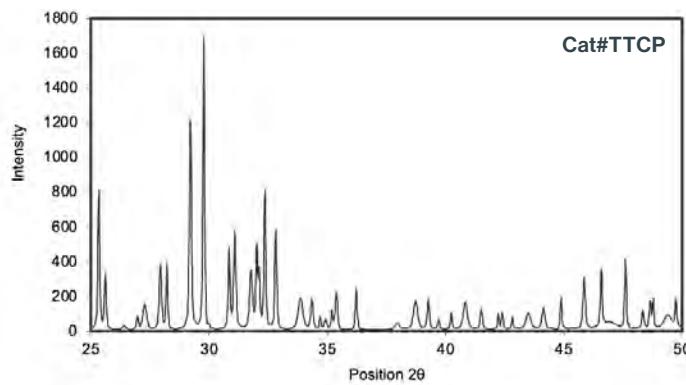
Appearance	Sintered powder with a tint of blue or grey color
Specific density	3.05 ± 0.10 g/cc (by gas pycnometry)

Chemical Properties

Chemical Formula	$\text{Ca}_4(\text{PO}_4)_2\text{O}$
Synonyms	tetracalcium diphosphorus nonaoxide

Composition

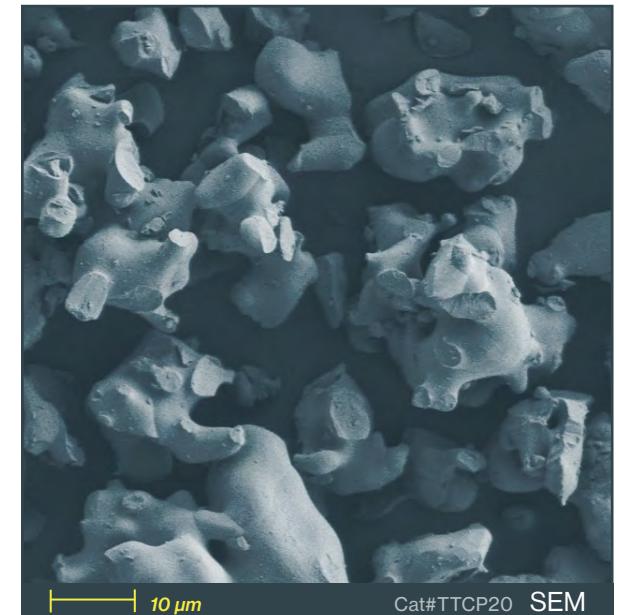
Tetracalcium phosphate $\geq 95\%$ **Other Ca-P phases** $\leq 5\%$ (by XRD)



Trace Elements

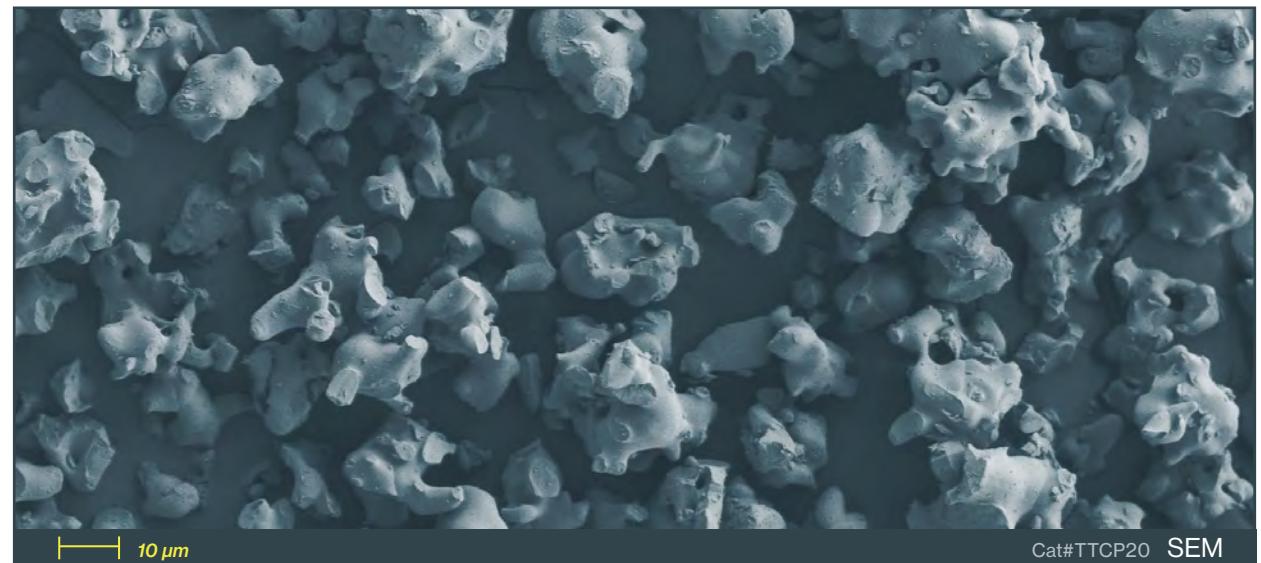
Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)





Tetracalcium phosphate (TTCP)



Particle Sizes

CATALOG #	SIZE RANGE
TTCP20	< 53 µm
TTCP13	< 10 µm – jet milled

Additional sizes are available upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

ATCP: Alpha-tricalcium phosphate

SWBTCP: Beta-tricalcium phosphate, precipitated + sintered

SSBTCP: Beta-tricalcium phosphate, solid-state sintered



SINTERED Biphasic calcium phosphate (BCP)

Biphasic calcium phosphate (BCP) is a mixture of hydroxyapatite (HA) and beta-tricalcium phosphate (b-TCP). It can be made in a variety of ratios, from 10% HA/90% b-TCP to 85% HA/15% b-TCP. Increasing the HA content increases the material's stability in the body. Similarly, increasing the b-TCP content, increases the bioactivity and resorption rate. BCP can be used in synthetic bone grafts and scaffolds for tissue engineering for bone resorption. It is also used in CaP-polymer composite implant materials and bone screws.

S1BCP is formed through a precipitation process. It is then sintered to create a highly crystalline powder.



Pictured: Sample of sintered BCP 50% HA/50% b-TCP with a size range of < 53 µm (Himed Cat#S1BCP50/5020). See attached pages for more product properties, composition and particle size options.



SINTERED Biphasic calcium phosphate (BCP)

Description

A sintered bioceramics mixture of hydroxyapatite and beta-tricalcium phosphate

Physical Properties

Appearance fine white powder free from contamination at 10X microscopy

Specific Density 3.08 to 3.15 ± 0.10 g/cc*
(by gas pycnometry)

* varies with composition

Chemical Properties

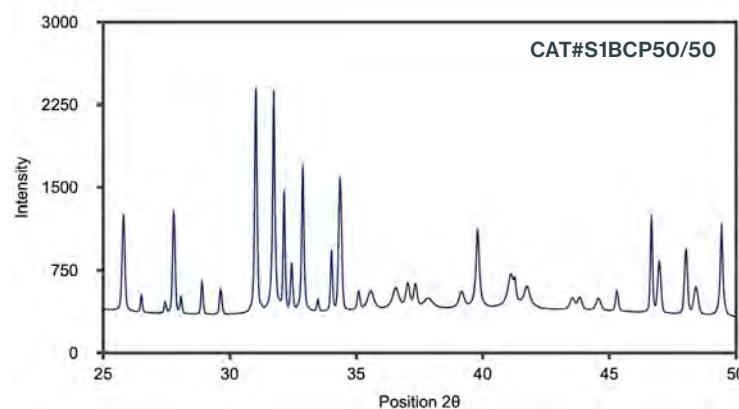
Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2 + \text{Ca}_3(\text{PO}_4)_2$

Synonyms HA/b-TCP
calcium phosphate

Composition

Hydroxyapatite ± 3% stated composition (by XRD)

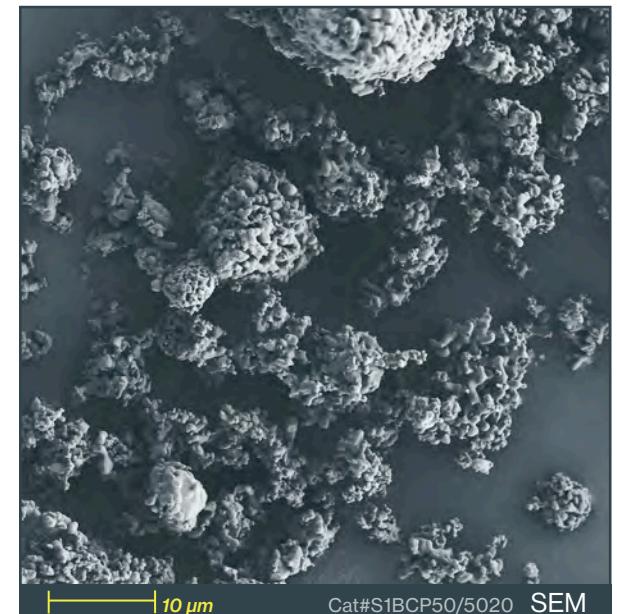
Beta-tricalcium phosphate ± 3% stated composition



Trace Elements Conforms to ASTM F1185

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(by ICP)

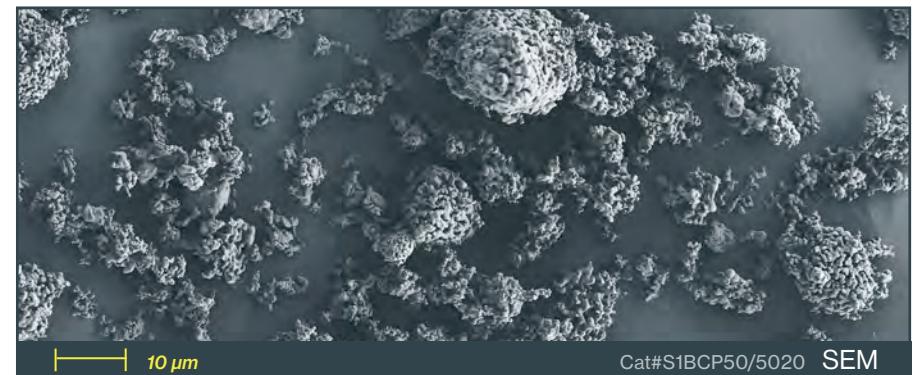




SINTERED Biphasic calcium phosphate (BCP)

Particle Sizes

	CATALOG #	SIZE RANGE
HA/b-TCP 60/40	S1BCP60/4035	125-425 µm
	S1BCP60/4003	< 250 µm
	S1BCP60/4020	< 53 µm
	S1BCP60/4013	< 10 µm
HA/b-TCP 50/50	S1BCP50/5035	125-425 µm
	S1BCP50/5003	< 250 µm
	S1BCP50/5020	< 53 µm
	S1BCP50/5013	< 10 µm
HA/b-TCP 40/60	S1BCP40/6035	125-425 µm
	S1BCP40/6003	< 250 µm
	S1BCP40/6020	< 53 µm
	S1BCP40/6013	< 10 µm
HA/b-TCP 30/70	S1BCP30/7035	125-425 µm
	S1BCP30/7003	< 250 µm
	S1BCP30/7020	< 53 µm
	S1BCP30/7013	< 10 µm
HA/b-TCP 20/80	S1BCP20/8035	125-425 µm
	S1BCP20/8003	< 250 µm
	S1BCP20/8020	< 53 µm
	S1BCP20/8013	< 10 µm



Additional sizes are available upon request.

Selected HA/b-TCP ratios are also available with HA from 10-85% upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

U1BCP: Biphasic calcium phosphate, unsintered

SSBTCP: Beta-tricalcium phosphate, solid-state sintered

SWBTCP: Beta-tricalcium phosphate, precipitated + sintered

UTCP: Tricalcium phosphate, precipitated + unsintered

MCHA: Hydroxyapatite, solid-state sintered

SWHA: Hydroxyapatite, precipitated + sintered

UWHA: Hydroxyapatite, precipitated + unsintered



UNSINTERED Biphasic calcium phosphate (BCP)

Biphasic calcium phosphate (BCP) is a mixture of hydroxyapatite (HA) and beta-tricalcium phosphate (b-TCP). It can be made in a variety of ratios, from 10% HA/90% b-TCP to 85% HA/15% b-TCP. Increasing the HA content increases the material's stability in the body. Similarly, increasing the b-TCP content, increases the bioactivity and resorption rate. BCP can be used in synthetic bone grafts and scaffolds for tissue engineering for bone resportion. It is also used in CaP-polymer composite implant materials and bone screws.

U1BCP is formed through a precipitation process. It is unsintered, but can be sintered to create a highly crystalline powder.



Pictured: Sample of unsintered BCP 65% HA/35% b-TCP with a size range of < 53 µm (Himed Cat#U1BCP65/3520). See attached pages for more product properties, composition and particle size options.



UNSINTERED Biphasic calcium phosphate (BCP)

Description

An unsintered bioceramics mixture of hydroxyapatite and beta-tricalcium phosphate

Physical Properties

Appearance Fine white powder
Free from contamination at 10x microscopy

Chemical Properties

Chemical Formula $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2 + \text{Ca}_3(\text{PO}_4)_2$
Synonyms HA/b-TCP
calcium phosphate

Composition

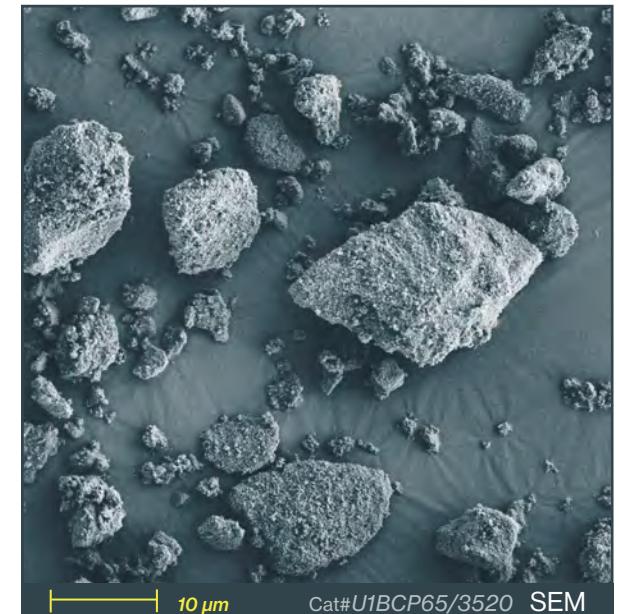
Low crystallinity calcium phosphate apatite at unsintered condition
High crystallinity after sintering at 1000-1150°C

Hydroxyapatite ± 3% stated composition
Beta-tricalcium phosphate ± 3% stated composition
(*after sintering, by XRD*)

Trace Elements Conforms to ASTM F1185

Arsenic (As)	< 3 ppm
Cadmium (Cd)	< 5 ppm
Mercury (Hg)	< 5 ppm
Lead (Pb)	< 30 ppm
Total heavy metals as lead	< 50 ppm

(*by ICP*)

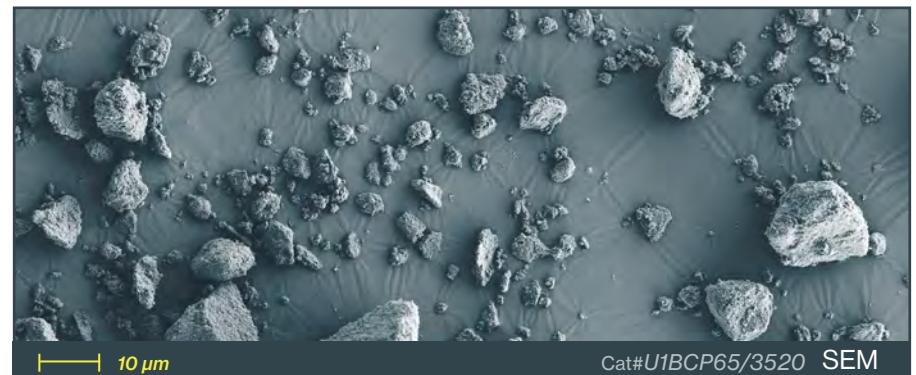




UNSINTERED Biphasic calcium phosphate (BCP)

Particle Sizes

	CATALOG #	SIZE RANGE
HA/b-TCP 85/15	U1BCP85/1535	125-425 µm
	U1BCP85/1503	< 250 µm
	U1BCP85/1520	< 53 µm
	U1BCP85/1513	< 10 µm
HA/b-TCP 65/35	U1BCP65/3535	125-425 µm
	U1BCP65/3503	< 250 µm
	U1BCP65/3520	< 53 µm
	U1BCP65/3513	< 10 µm
HA/b-TCP 55/45	U1BCP55/4535	125-425 µm
	U1BCP55/4503	< 250 µm
	U1BCP55/4520	< 53 µm
	U1BCP55/4513	< 10 µm
HA/b-TCP 25/75	U1BCP25/7535	125-425 µm
	U1BCP25/7503	< 250 µm
	U1BCP25/7520	< 53 µm
	U1BCP25/7513	< 10 µm
HA/b-TCP 15/85	U1BCP15/8535	125-425 µm
	U1BCP15/8503	< 250 µm
	U1BCP15/8520	< 53 µm
	U1BCP15/8513	< 10 µm



Additional sizes are available upon request.

Selected HA/b-TCP ratios are also available with HA from 10-85% upon request.

Himed manufactures this product in its state-of-the-art New York facility under good manufacturing process (GMP).

Related Products

S1BCP: Biphasic calcium phosphate, sintered

SSBTCP: Beta-tricalcium phosphate, solid-state sintered

SWBTCP: Beta-tricalcium phosphate, precipitated + sintered

UTCP: Tricalcium phosphate, precipitated + unsintered

MCHA: Hydroxyapatite, solid-state sintered

SWHA: Hydroxyapatite, precipitated + sintered

UWHA: Hydroxyapatite, precipitated + unsintered