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Enzymes


AMERICOS
INDUSTRIES INC.

★★ Concept Driven Chemicals

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It gives me great pleasure to present the second issue of "AIM." There was a heavy demand for the first issue, which focused on innovations in denim, and all the copies were exhausted in no time. This time, our objective is to provide information on the usefulness of enzymes, especially in textile wet processing. Of course, you will also find some of the latest developments on denim in this issue.

One significant trend in textile wet processing is the growing need to be eco-friendly. Products that require less energy and less water will be preferred. With the introduction of enzymes in textile wet processing, the industry has taken a great leap forward. Enzymes are not only eco-friendly but also processor-friendly in that they do not require high-temperature or high-pressure conditions.

There has been strong growth in the Indian enzyme market in recent years, driven by macro-economic developments. Even though enzyme use is still in its nascent stage, growing awareness of the benefits of enzymes make for attractive growth potential. The expected growth in the Indian enzyme market is more than 15% per annum over the next 10 years.

In addition to using enzymes in textile wet processing, we have also recently launched a comprehensive range of food-processing enzymes with applications in baking, fruit juices, dietetics, eggs, flavor, fruits, vegetables and protein.

Americos is a provider of enzymes with a difference. Our philosophy is to work in tandem with customers to troubleshoot their specific problems and to provide tailor-made products in order to apply the technology and experience gained over our long history to solve a wide range of processing problems.

I hope you enjoy this issue of "AIM"!

With warm regards,

Ashok Khanna
Managing Director

APPRECIATING ENZYMES

Since the first amylases, employed for desizing in 1950s, the scope of enzymes for textile wet processing has been on its increase and has widened remarkably in the last decade. Enzymes are being applied in almost every step of textile wet processing ranging from desizing, scouring, bleaching, upto finishing and even effluent treatment and in that such enzymes as pectinase, pectatelyase, (pectolytic enzymes), lipases, proteases, laccases, catalases, and cellulases in addition to amylases are being employed.

The reasons behind the success of enzymes can be summed up in few words: Efficiency, Precision, Specificity, Convenience, Cost-effectiveness; Energy, Water and Chemical Saver, Environmental Responsiveness and Safety .

Enzymes are biopolymers. They act as catalysts and accelerate reaction by a factor of 10^3 - 10^6 .

WHAT ARE ENZYMES?

- Enzymes are proteins

Like other proteins, enzymes consist of long chains of amino acids held together by peptide bonds. They are present in all living cells, where they perform a vital function. They control the metabolic processes whereby nutrients are converted into energy. Enzymes take part in the breakdown of food materials into simpler compounds. Some of the best-known enzymes are those found in the digestive tract. Pepsin, trypsin and peptidases break down proteins into amino acids. Lipase split fats into glycerol and fatty acids. Amylases break down starch into simple sugars. Thus, enzymes help transform food into tiny nutrients that the body can absorb and provide energy.

- Enzymes are catalysts

Enzymes, by their mere presence and without being consumed in the process, can speed up chemical processes that would otherwise run very slowly, if at all.

Enzymes enhance reaction rate by lowering activation energies. After the reaction is complete, the enzyme is released again, ready to start another reaction. In principle, this could go on forever, but in practice most enzymes have a limited stability and sooner or later their activities become so low that it is no longer practical to use them. Most industrial enzymes are used only once and discarded after they have done their job.

Common sense in an uncommon degree is what the world calls wisdom.

- Samuel Taylor Coleridge

- **Enzymes are specific**

Each enzyme can break down or synthesize one particular compound. In some cases, they limit their action to specific bonds in the compounds with which they react. The specific action of enzymes allows high yields to be obtained with a minimum of unwanted by-products.

- **Enzymes are efficient**

Enzymes are very efficient catalysts. For example, the enzyme catalase, which is found abundantly in the liver and in the red blood cells, is so efficient that in one minute one enzyme molecule can break down 5 million molecules of hydrogen peroxide (or 700 times its weight of peroxide) into water and oxygen.



- **Enzymes work in mild conditions**

Being designed to work in living cell, enzymes can work at atmospheric pressure and in mild conditions with respect to temperature and pH. For certain applications, special enzymes have been developed that work at higher temperatures. However, they cannot withstand temperature above 100°C for long.

Enzyme processes are, therefore, energy saving and save investment in special equipment resistant to heat, pressure or corrosion.

Due to their efficiency, specific action, the mild conditions in which they work and their high biodegradability, enzymes are very well suited for a wide range of industrial applications.

Enzymes are always at work in nature. Fruits contain enzymes. Pectolytic enzymes bring about a gradual ripening of fruits causing them to become softer.

How do Enzymes Work?

Enzymes are highly specific and function according to the so-called lock-and-key principle. Enzyme can catalyze only a specific reaction. The substrate must first mechanically bind itself with the enzyme. After the successful locking and the formation of an enzyme-substrate complex, the catalysis of the reaction occurs. The formed fragments loosen from the enzyme and the freed enzyme can catalyze a new substrate. Enzymes decrease the required activation energy for the chemical reaction and enable a reaction (metabolism) to work with distinctly less energy.

Knowledge is proud that he has learn'd so much; Wisdom is humble that he knows no more.

- William Cowper



• Enzymes for industrial processes

Many chemical processes used in the industries have inherent drawbacks from commercial and environmental standpoint.

Non-specific reactions may result in poor product yield and unwanted by-products (product impurities).

High temperatures and high pressures needed to drive reactions which lead to high energy costs and require large volumes of cooling water down-stream.

High temperatures, pressures, harsh chemicals call for special equipments and hence high, capital investment. These also have negative impact on the environment.

All these drawbacks can be virtually eliminated by using enzymes. Enzymes contribute to sustainable development. They are isolated from microorganisms, which are renewable resources. Enzymes work under milder conditions and are highly specific. Enzymes are required in small amounts and need little storage space. Enzyme reactions are controllable and save water and energy. Enzymes, being biodegradable, reduce impact on environment.

In light of foregoing, it is not surprising that number of commercial applications for enzymes is increasing. Summarized below are different tasks, the enzymes are put to :

• Detergents

Enzymes have contributed greatly to improvement in performance of detergent, and today, detergents are the largest application area for enzymes. The following benefits accrue:

- Better cleaning and stain removal
- Shorter washing time
- Lower washing temperature
- Reduced water and energy consumption
- More effective soil release
- Minimal environmental impact
- Rejuvenation of cotton fabrics (through the action of cellulase)

Enzymes also find application in automatic dish washing detergents. The major detergent enzymes are: Proteases, Lipases, Amylases, Cellulases and for dish washing are: Proteases and Amylases

Proteases have also been used for cleaning MF-, UF-, and RO - membranes.

Intelligence and education can ascertain the facts. Wisdom can discover the truth.

- Max De Pree



• Personal Care

Some tooth pastes and mouth washes incorporate glucoamylase and glucose oxidase which have positive effect in preventing plaque. Dentures can be cleaned with products containing protease.

Contact lenses are cleaned using solutions containing proteases or lipases or both. The residual hydrogen peroxide used for disinfection is neutralized using catalase before the lens is inserted.

• Textiles

In fabric desizing, the fabric is washed hot (90 -95°C) to gelatinize starch. The fabric is then treated with amylase to degrade starch into dextrans, followed by hot (90 - 95°C) washes to remove dextrans.

Scouring is the process of purifying cotton fabrics from impurities such as wax, pectins, hemicelluloses and mineral salts. Pectins acts like glue between the fibre core and the waxes which can be destroyed by an alkaline pectinase.

Catalases are used for degrading residual hydrogen peroxide. Proteases are used for wool treatment and for degumming of raw silk.

In denim finishing a small dose of cellulase can replace several kilograms of stones. The damage to machine as well as to garment is much less and so also the generation of pumice dust. There is no pumice dust sediment in waste water which could otherwise block drains. The wash-off process becomes less cumbersome and the productivity increases.

The neutral cellulase can prevent backstaining (redeposition of released indigo on to garments)

The cellulase treatment prevents pilling. Removal of fuzz, softer feel, and color brightness are added benefits.

Lyocell (cellulosic fibre made from wood pulp) has tendency to fibrillate when wet.

The fibrils on the surface can peel up, if not removed. In order to overcome the problem, Lyocell fabrics are treated with cellulases.

Protease finds applications in treatment of wool and silk.

Further, enzymes are extensively used in food and leather industry. Synthesis of biopolymers, organic synthesis, flavor enhancing, are important usage avenues.

A loving heart is the truest wisdom.

- Charles Dickens

• Epilogue

Most industrial enzymes are produced using microorganisms belonging to either the genus *Bacillus* (Gram positive bacteria) or genus *Aspergillus* (Filamentous fungi)

It is estimated that there are four to five million different species of microorganisms. The enzymes industry is keen to exploit this diversity by gathering soil and water samples and testing these samples for the presence of microorganisms that produce enzymes of interest.

Enzyme molecules are far too complex to synthesize by pure chemical means. The only way of making them is to use living organisms. Genetic engineering is a far more efficient option because the changes are completely controlled. The process basically involves taking the relevant gene from the microorganism that naturally produces a particular enzyme and inserting it into another microorganism that will produce the enzyme more efficiently.

Since the catalytic properties of any enzyme are determined by its three-dimensional structure, which in turn is determined by the linear combination of the constituent amino acids, one can also alter enzyme properties by replacing individual amino acid in the relevant gene.

Detergent enzyme can be made more bleach stable by using the mentioned protein engineering. Furthermore, enzymes can be given other useful properties, for example, improved heat stability, higher activity at low temperatures, reduced dependency on co-factors such as calcium.

Detergents currently represent by far the largest single market for industrial enzymes. Enzymes have been responsible for numerous improvements in wash performance since 1960s. Enzymes have also contributed to more environmentally adapted washing and cleaning because enzymes are biodegradable, they can replace harsh chemicals, and reduce wash temperature. Nevertheless, washing laundry or dishes still require large quantities of chemicals.

The current developmental trend would lead to detergent systems that use much smaller quantities of chemicals, less water and less energy.



He is a wise man who does not grieve for the things that he has not, but rejoices for those that he has

- Epictetus

AMERICOS TEXTILE ENZYMES

Class	Product	Application	Benefits
Desizing Enzymes	Americos Amylase 180	<p>Amylase 180 is used for desizing of denim garments</p> <p>Application Conditions Temperature: 60-70°C pH : 6.5-7.5</p> <p>Suitable M/c Wash wheel, Soft flow m/c, Winch and Padding</p>	<ul style="list-style-type: none"> • Bacterial alpha amylase is more efficient - effective and is stable over wide temperature range of 20-80°C • Mixture of highly concentrated alpha-amylase, wetting agent and lubricant • This unique combination is highly functional and prevents the formation of creases, streaks, and crack marks during desizing process. • Converts most of the sizes viz. starch, starch derivatives, into water-soluble products
	Americos Amylase 110	<p>Desizing of grey cotton fabrics for batch and semi continuous process</p> <p>Application Conditions Temperature: 60-70°C pH : 6.5-7.5</p> <p>Suitable M/c Jigger, Winch, Pits, Pad- Batch</p>	<ul style="list-style-type: none"> • Bacterial alpha-amylase is stable over wide temperature range of 20-80°C • Converts starch and its derivatives into water-soluble products
	Americos Amylase 380	<p>Desizing of grey cotton fabrics for continuous process</p> <p>Application Conditions Temperature: 100°C pH : 6.5-7.5</p> <p>Suitable M/c Jigger, Winch, Pad - steam system</p>	<ul style="list-style-type: none"> • Unique blend of thermally stable alpha-amylase • Used at near boiling temperature • Very fast desizing

It is a wise man who said that there is no greater inequality than the equal treatment of unequals.

- Felix Frankfurter

AMERICOS TEXTILE ENZYMES

Class	Product	Application	Benefits
Bio-polishing Enzymes	Americos Biogloss XL	<p>Bio-polishing enzyme for woven fabrics and garments</p> <p>Application Conditions Temperature: 55-60°C pH : 4.5-5.5</p> <p>Suitable M/c Wash Wheel, Soft Flow m/c</p>	<ul style="list-style-type: none"> • Clear and clean fabric surface • Removes pills and pilling tendency • Improves softness • Improves drape • Brightens color
	Americos Biofade N30	<p>Bio-polishing enzyme for knitted fabrics and wash down effect on knit fabric/ garments, sweater and socks</p> <p>Application Conditions Temperature: 55°C pH : 4.5-5.5</p> <p>Suitable M/c Wash Wheel, Soft Flow m/c</p>	<ul style="list-style-type: none"> • Clear and clean fabric surface • Stone wash effect • Remove pills and pilling tendency • Improves softness and smoothness • Improves drape • Less treatment time • Overall economy in per garment treatment cost
	Americos Biogloss 2XL	<p>Bio-polishing enzyme for low color cutting on woven fabrics and garments</p> <p>Application Conditions Temperature: 38-48°C pH : 4.5-5.5</p> <p>Suitable M/c Wash Wheel, Soft Flow m/c</p>	<ul style="list-style-type: none"> • Low Color Fading • Clear and clean fabric surface • Reduces pilling tendency • Improves softness and smoothness • Improves drape • Reduces cycle time • Low operating temperature

Wisdom too often never comes, and so one ought not to reject it merely because it comes late.

- Felix Frankfurter

AMERICOS TEXTILE ENZYMES

Class	Product	Application	Benefits
Fading Enzymes	Americos Cellscos 450 AP	<p>Mixture of acid cellulase enzymes for salt and pepper effect on denim</p> <p>Application Conditions Temperature: 55°C pH : 4.5-5.5</p> <p>Suitable M/c Wash Wheel</p>	<ul style="list-style-type: none"> • Concentrated acid cellulase enzyme • High contrast • Better and bigger granular effect • Improves feel and drape
	Americos Cellucom 110 OM	<p>Neutral enzyme for grey cast effect</p> <p>Application Conditions Temperature: 55°C pH : 5.5 - 7.5</p> <p>Suitable M/c Wash Wheel, Soft Flow m/c</p>	<ul style="list-style-type: none"> • Highly concentrated neutral cellulase produced by fermentation of non-pathogenic fungi • Low back staining • High contrast • Improves the feel • Very broad effective pH range (5.5 - 7.5)
Peroxide Removal Enzyme	Americos Catalase XL	<p>It removes last traces of residual hydrogen peroxide</p> <p>Application Conditions Temperature: 20-50°C pH : 3-10</p> <p>Suitable M/c Jigger, Winch, Pits, Wash wheel, Soaper</p>	<ul style="list-style-type: none"> • Catalase XL degrades residual hydrogen peroxide in bleached fabrics into water and oxygen with positive influence on subsequent dyeing • Eco-friendly treatment since no chemical type reducing agents are used to kill peroxide residues. • Reduces water consumption during washing and saves time • Wide application pH range i.e. from 3-10 and temperature upto 20-50°C • Increase reproducibility of dyeing

No man is really wise until he is kind and courteous.

- Charles Haas

AMERICOS TEXTILE ENZYMES

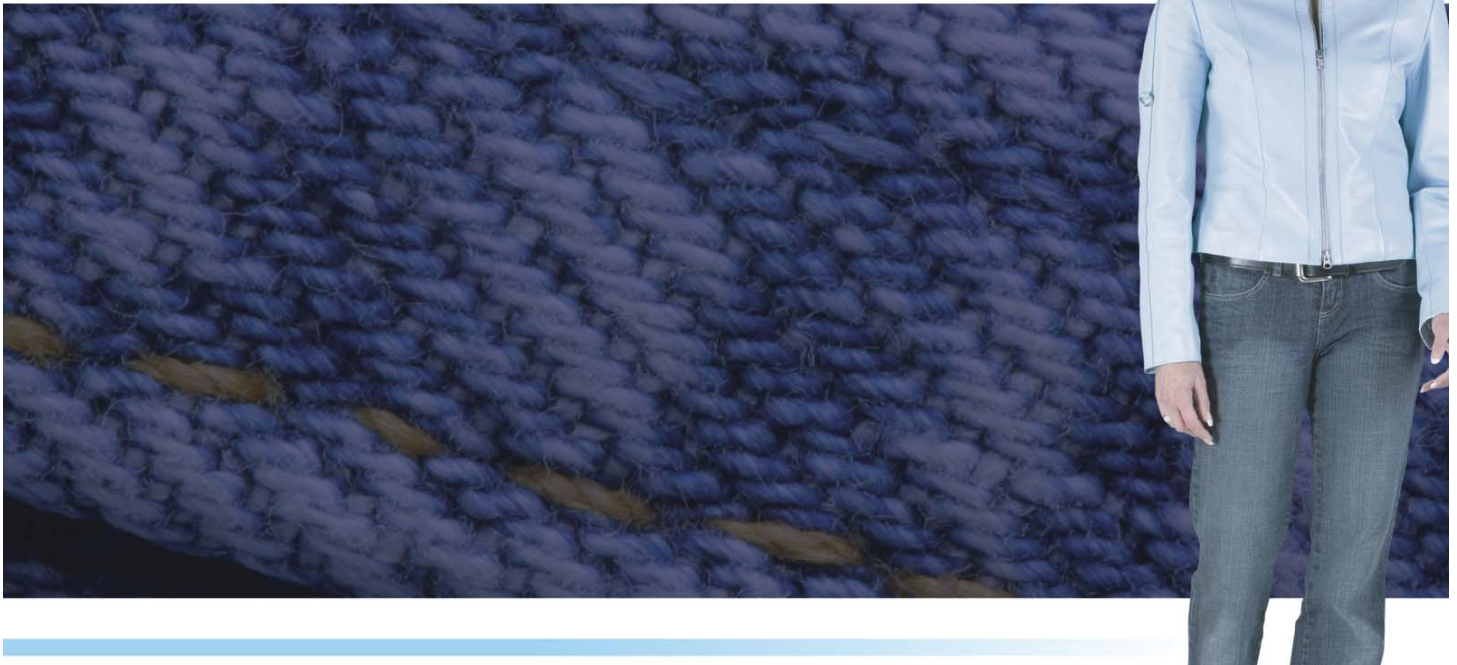
Class	Product	Application	Benefits
Bio-scouring Enzyme	Americos Bio-Scoured XL	<p>Americos Bio-Scoured XL is used for bio-scouring process to make fabric absorbent.</p> <p>Application Conditions Temperature: 50 -55°C pH : 8-8.5</p> <p>Suitable M/c Jigger, Winch, Wash wheel, Bleaching Range</p>	<ul style="list-style-type: none"> • Softer fabric • Reduces water consumption • Reduces energy consumption • Mild application conditions • Eco-friendly process, less effluent
Wool Softening Enzyme	Americos Protease XL	<p>Americos Protease XL is used for descaling of wool fibre and bio-polishing effect. It can also be used to sand wash silk.</p> <p>Application Conditions Temperature: 50-60°C pH : 7-9</p> <p>Suitable M/c Wash wheel and Soft flow m/c</p>	<ul style="list-style-type: none"> • Reduces pilling and felting of wool • Improves softness of wool
Bio-polishing enzyme with softener	Americos Maxine NE	<p>Americos Maxine NE produces bio-polish effect with softening in one step.</p> <p>Application Conditions Temperature: 55°C pH : 4.5-5.5</p> <p>Suitable M/c Wash wheel and Soft flow m/c</p>	<ul style="list-style-type: none"> • Mixture of cellulase and softener. • Enhances bio-polishing effect, softness and hand feel. • Does not affect the typical tone of Indigo. • Saves 3-4 washing cycles and hence energy, water and time

The growth of wisdom may be gauged exactly by the diminution of ill-temper.

- Friedrich Nietzsche

AMERICOS TEXTILE ENZYMES

Class	Product	Application	Benefits
Denim Bleaching Enzyme	Americos Laccase P	<p>Americos Laccase P is used for bleaching of indigo dye.</p> <p>Application Conditions Temperature: 65°C pH : 4.5-6</p> <p>Suitable M/c Wash wheel</p>	<ul style="list-style-type: none"> • Attacks indigo selectively • Imparts even 'super-stone wash' effect unlike the patchy appearance imparted by pumice stones • Shortens stone-wash cycle • Reduces back staining • Ideal bleaching agent for denims containing elastic fiber



The art of being wise is the art of knowing what to overlook.

- William James

QUESTIONS & ANSWERS – ENZYMES

Q : Why desizing fails to remove starch completely?

A: Starch/Starch derivative, synthetic polymers and tallow / paraffin based lubricants are the main ingredients of a traditional sizing recipe.

Having met with the prime objective of an efficient weaving, the next important objective is to achieve complete removal of size from the woven fabric in the desizing process. However, in most cases the removal of size is not complete.

A recent finding has been that the lubricant being triglyceride, can be almost completely hydrolyzed by enzyme Lipase yielding glycerol fatty acids and mono & diglycerides. Glycerol is completely soluble in water. Fatty acids are removable in scouring and mono & diglycerides are known efficient surfactants / emulsifiers. Thus, lipase in admixture with alpha amylase should not only improve desizing but also the subsequent scouring.

Another finding has been that starch and triglycerides form insoluble complexes. Lipase is expected to break these complexes. Thereby facilitating the removal of starch.

In brief complementing alpha-amylase with lipase during desizing will result in improved desizing and uniformity of desizing.

Further Lipase is much less dependant on mechanical action than amylase. Lipase assisted desizing of denim results in softer hand.

Thermostable alpha-amylase and lipase having the same useful pH range (bio compatibility) can make an effective cocktail for fabric preparation.

Lastly, the success of desizing relies on pick-up of desizing liquor by the fabric under desizing. Making desizing liquor more viscous by adding polymeric materials. (Polyacrylamide for example) can assist in increasing wet pick-up.

Alternatively, the step of desizing needs to be done twice. However, the best approach is to wash the grey fabric in hot (95°C) water to swell the starch (gelatinization) followed by desizing, because enzymes act upon swollen starch only. It is good to use anionic wetting agent in the enzyme recipe.

Q : Is there any occupational problem in enzyme use? How safe are household enzyme-based products?

A: Enzymes are proteins. Proteins (pollen / animal hair for example) can cause allergies. Enzymes are potential inhalation allergens. Inhalation of even small concentrations of a foreign protein in the form of dust or aerosol can stimulate the body's immune system to produce antibodies.

In some individuals, increased concentrations of antibodies can trigger the release of histamine. This compound can cause symptoms such as watery eyes, running nose and sore throat.

The encapsulated enzymes (or liquid enzymes) combined with improved operating practices has brought levels of airborne enzyme dust down dramatically.

Some international reports conclude that enzymatic laundry products and dish washing detergents are safe for consumers to use.



Make wisdom your provision for the journey from youth to old age, for it is a more certain support than all other possessions.

- Diogenes Laertius

fed up with **back-**
staining on denim
garments during
enzymatic process?
we could suggest a
powerful solution.

Americos Superior Pocket White

This matchless product will do wonders for you. Say bye bye to back - staining!



★ ★ Concept Driven Chemicals

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QUESTIONS & ANSWERS – ENZYMES



Q : What are enzyme toxins ?

A: Enzyme activity can be affected by other molecules. Foreign molecules/materials that decrease or abolish enzyme activity are enzyme inhibitors / toxins / poisons.

As against this, the enzyme activators increase enzyme activity. The inhibitors bind enzymes tightly resulting into their inactivation. Inhibition could be detrimental resulting into loss of enzyme-activity. Inhibition could be beneficial in some cases. For example, Aspirin inhibits enzyme activity that produces inflammation, thereby suppressing pain.

Q : What are co-enzymes ?

A: Some enzymes are self-sufficient and do not need any additional components to display their full activity. However, there are enzymes that require non-protein molecules to be bound for exhibiting their full activity. Such enzyme cofactors can be either inorganic metal ions or organic compounds known as co-enzymes. Some enzymes contain sites that bind co-factors which are needed for catalysis.

Wisdom is ever a blessing; education is sometimes a curse.

- John A. Shedd



ENZYME LACCASE

(A strong candidate for impartation of even 'super stone wash')

The most interesting feature of enzymes is their high specificity, meaning, their ability to attack selectively a given substrate.

Among the two traditional enzymes used in the treatment of denim garments are amylase for desizing and cellulase for biopolishing. Enzyme laccase is relatively recent one that attacks indigo selectively; meaning it is highly suitable for discoloring of indigo dyed denims. Hence, Laccase is an invaluable candidate for new applications.

Americos Laccase P is one such active laccase enzyme, specially developed for impartation of 'super stone wash' which is even, unlike the patchy appearance imparted by pumice stones. Alternatively, a short cycle with the laccase is adequate for homogeneity after standard stone wash. The treatment time may reduce by 20-30%.

In other words the standard 100 min stone wash cycle may become 60 min stone wash followed by the laccase wash of 15 min, totaling 75 min, saving 25 min. Thus, Americos Laccase P offers an alternative path to super stone washing with an attractive contrast. Needless to say, the laccase is an eco-bleach and out-performs reductive and oxidative bleaches. This characteristic of Americos Laccase P makes it ideal for elasticized fabrics which are sensitive to chemical bleaches.

Generally laccase is not compatible with cellulase (also with reducing / oxidizing agents and acids / alkalis). However, it can be used with pumice stones. In this treatment, stones give abrading effect and laccase enhances abrasion coupled with fading. The indicative treatment may use 10-20 g of laccase / kg of fabric, M: L ratio of 5, pH 4.5-6, temperature 65°C, and treatment duration of 15-30 min.

Wise men and women in every major culture have maintained that the secret of happiness is not in getting more but in wanting less.

- Philip Slater

AMERICOS NEW DEVELOPMENTS IN GARMENT PROCESSING

1. Permanent Wrinkle Formation at Low Temperature:

Wrinkle formation adds value by creating permanent wrinkles in certain places in denim garments. In this process, a special curing resin with Americos Catalyst KM is sprayed onto the back side of the garment, and then creases and folds are created manually. Creases are tagged with fine polyester/nylon thread using a tagging gun, and the garment is then cured in a tumbler drier at 80°C. The wrinkles that are formed on the garment are permanent and stable even after multiple home launderings.



2. White Discharge on Denim:

Americos offers a system for white discharge on denim garments through a thermocol ball-wash process. Americos also offers a system for over-dyeing denim garments.



3. Single Bath Washing -Tinting and Softening:

Tinting of denim garments is done after stone-washing. Americos' Dy-soft color system allows tinting and softening at the same time. With the Dy-soft color system, the denim garments assume a tint for a different appearance. Combining Dy-soft and stone-washing process into one step shortens the process cycle.

Advantages:

- Stone washing, tinting and softening in one step
- Shortened process cycle
- Water- and energy-saving
- More economical and eco-friendly

AMERICOS NEW DEVELOPMENTS IN GARMENT PROCESSING

4. Highlighting of Certain Portions of Denim Garments during Dyeing:

Americos Color Enhancer increases the depth of shade where it is applied on garments during the dyeing process, providing an excellent highlighting effect, especially on light shades. The Color Enhancer is applied on puckering and pockets of the denim garments which are to be tinted with Americos Dy-soft color, so only the parts where the Color Enhancer is applied are highlighted, leaving the rest of the garment its original blue.



5. Improving the Whiteness of Potassium Permanganate Discharge:

Catalyst KM has been developed for activation of potassium permanganate. It increases the discharging power of potassium permanganate, which results in snow whiteness discharge. Americos Catalyst KM also improves contrast in the ball wash process.



6. Color Protector for Denim:

Americos protector SLM resists direct and reactive dyeing. Certain areas are treated with Protector SLM, cured for 2-5 minutes at 150°C, then dyed per the normal recommended method. The areas printed with Protector SLM will not pick up dyes.

FOOD ENZYMES

Americos launches a wide range of food enzymes having applications in baking, dietetics, eggs, flavor, fruit and vegetable processing, and proteins.

Our food enzymes are for specific process problems and to custom-made enzyme products for customers' requirements.

1. For baking, there are enzymes for biscuits, breads, rolls etc
2. For dietetics, there are enzymes for digestion of dietary starch, dietary fats and lipids, dietary proteins etc
3. For eggs, there are enzymes to prevent egg white browning, remove yolk lipid contamination, lyso-lecithin manufacture etc
4. Flavor enzymes for various applications that are very distinctive.
5. For fruit and vegetable processing, there are enzymes used for increasing yield, reducing waste, quality improvement etc
6. For proteins, there are enzymes for various applications

In a nutshell, our food enzyme range gives increased yield, reduction of wastage, better quality, valuable by-products, increased throughput, filtration aid for extension of filter life, and consistent process operations.



The most manifest sign of wisdom is a continual cheerfulness.

- Michel de Montaigne

AMERICOS FOOD ENZYMES



BAKING



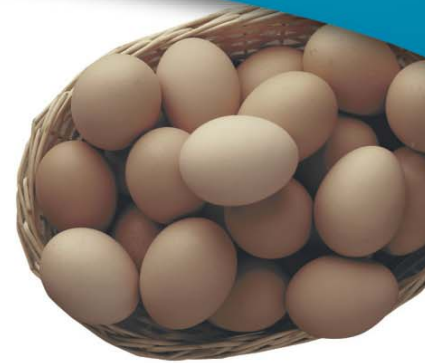
ENZYME	APPLICATION
Amylase	Fungal alpha amylase, protease free, full range of activities to 120,000SKB.
Proteinase, pentosanase	Metabisulphite replacer in biscuits and crackers.
Complete spectrum	For English-style muffins, this product improves the spread of the dough piece.
Complete spectrum	For English-style muffins, higher protease content than C466P.
Amylase	Liquid bacterial product for French style bread.
Pentosanase	Lower activity, protease free pentosanase. Source: Trichoderma.
Pentosanase	High activity, protease free pentosanase. Source: Trichoderma. Can be used in bread improvers.
Maltase/AMG	Increases level of available glucose therefore suitable for rye bread and low sugar doughs.
Alpha amylase	Speciality amylase for French type bread.
Pentosanase	Aspergillus pentosanase without amylase.
Pentosanase	Endo-xylanase for bread improvers. Source: Bacillus.
Amylase, Pentosanase	Increased bake-out volume in bread and rolls.
Pentosanase & amylase	General bread improver suitable for both Continental process or Chorleywood process.
Pentosanase & amylase	Baking improver specifically formulated for rye bread.
Glucose Oxidase	General baking improver.
Glucose Oxidase	New generation bromate replacer.
Baking lipase	Baking lipase for improved dough strength, volume, and crumb whiteness.
Baking lipase	Very cost effective baking lipase for improved dough strength, volume, and crumb whiteness.
Proteinase (bacterial)	Bacterial proteinase for biscuits and crackers.
Proteinase (fungal)	Fungal proteinase for improving dough handling and bread texture.
Proteinase	Fungal proteinase to improve loaf volume, crust colour, flavour and crumb softness.
Proteinase	Bacterial proteinase for wafer biscuits.

We can be knowledgeable with other men's knowledge, but we cannot be wise with other men's wisdom.

- Michel de Montaigne



AMERICOS FOOD ENZYMES



DIETETICS

ENZYME	APPLICATION
Amylase	Aid for digestion of dietary starch.
Proteinase	High effective proteinase for acid environments.
Proteinase	Pineapple proteinase range of activities up to 2000GDU.
Cellulase	Aid for digestion of dietary cellulose.
Xylanase	Aid for digestion of dietary hemicellulose.
Lactase	Aid for digestion of dietary lactose.
Lipase, Esterase	Aid for digestion of dietary fats and lipids.
Amylase, Lipase, Proteinase	General aid for the digestion.
Proteinases	Broad spectrum protease for aiding the digestion of dietary proteins.
Proteinase, 100TU (on Lactose)	Broad spectrum protease for aiding the digestion of dietary proteins.
Sucrase	Digestive aid for breaking down sucrose.

EGGS

ENZYME	APPLICATION
Catalase	Breaks down residual hydrogen peroxide into harmless by-products.
Glucose oxidize	Prevents browning.
Phospholipase	Improves emulsification and gelation properties of egg yolks.
Lipase	Breaks down lipid complexes to ensure egg whites maintain foaming capacity.
Proteinase	Improves foaming ability by modifying egg white protein.

Wisdom outweighs any wealth.
- Sophocles

AMERICOS FOOD ENZYMES



FLAVOUR

ENZYME	APPLICATION
Cellulase, Pectinase, Beta-Glucosidase	Versatile formulation for extraction from a wide range of plant materials including vanilla.
Peptidases	Debittering of protein hydrolysates.
Esterase, Lipase (Proteinase)	General fat hydrolysis and enzyme modified cheese (EMC) production.
Lipase, Esterase	Protease free high activity lipase for hydrolysis of oils, tallow and fats including butterfat.
Lipase, Esterase	Meaty flavours from soft animal fat eg chicken.
Esterase	Protease free lipase for enzyme modified cheese (EMC) production. Cheddar flavours.
Esterase(Proteinase)	Enzyme modified cheese (EMC) production. Cheddar flavours.
Lipase, Esterase,(Proteinase)	Cost effective mixed enzyme for producing Cheddar type EMC.
Esterase, Lipase	Produces typical Cheddar-type flavour.
Esterase	Protease free lipase for enzyme modified cheese (EMC) production. Blue cheese flavours.
Lipase	Protease free lipase resulting in medium sharp blue flavour EMC.
Lipase, Esterase	Microbial product suitable for production of low level blue flavour notes. Suitable for vegetarian and kosher markets.
Endo-Proteinase	For use with protease free lipases in enzyme modified cheese (EMC) production. Introduces protein notes.
Peptidases	High performance peptidase used to control bitterness in EMC cheese production.

A smile will gain you ten more years of life
- Chinese Proverb

AMERICOS FOOD ENZYMES

FRUIT AND VEGETABLE PROCESSING

ENZYME	APPLICATION
Cellulase	Very high activity cellulase preparation.
Cellulase, Pectinases, Beta-Glucosidases	Versatile formulation for maceration and extraction in a wide range of fruits and vegetables including carrots and mangoes.
Alpha-Amylase, Ferulic Acid Esterase	Hydrolysis of starches during fruit processing.
Beta-glucanase	Eliminates very fine particulates during beer production resulting in longer filter life.
Cellulase, Ferulic Acid Esterase	Macerating enzyme particularly suitable for the production of vegetable bouillon, carrot, leek and other vegetable concentrates.
Ferulic Acid Esterase	Macerating enzyme releasing high levels of bound sugars. Multiple applications including phenolic acid release for vanillin and sun cream production.
Beta-Glucanase	Improved mash and fermentation performance(run off and solubles) in brewing applications.
Beta-Glucanase	Concentrated (5X) glucanase for improved mash and fermentation performance in brewing applications.
Glucose Oxidase	For the removal of glucose from soft drinks.
Pectinases	Improved performance in wide range of fruit juice extraction applications (high pectin lyase, low pectinesterase).
Pectinases	Enhanced flavour development in white wines.
Pectinases	Improve extraction rates and flavour enhancement of white wines.
Pectinases	Cost efficient peeling of citrus fruits using an automated process.
Pectinases	Highly active formulation for general depectinising applications.
Pectinases, Cellulase	Peeling of citrus fruit especially grapefruit into individual segments.
Pectinases	Unsurpassed release of colour from cranberries.
Papain, 100TU	Papain liquid for prevention of chill haze in brewing.

Wisdom is oftentimes nearer when we stoop than when we soar.

- William Wordsworth

AMERICOS FOOD ENZYMES



PROTEINS

ENZYME	APPLICATION
Pepsin	Acid Proteinase.
Proteinase	Microbial alkaline proteinase suitable for hydrolysing keratins present in hair and sheep's wool. (Non-food grade).
Pectinase	For viscosity reduction of soya polysaccharides.
Proteinase	Neutral bacterial proteinase.
Proteinase	Papain-liquid, range of activities up to 200TU.
Proteinase	Papain-powder, range of activities up to 1000TU.
Endo-Proteinase	Acid, fungal proteinase.
Proteinase	Neutral, fungal proteinase.
Proteinase	Mixed fungal and bacterial proteinases for Stage 1 in eHVP cascade (hydrolysis).
Proteinase	Fungal proteases for stage 2 in eHVP cascade (de-bittering).
Proteinase, Amylase	Mixed fungal and bacterial enzyme activities for stage 3 in eHVP cascade (filtration aid).
Proteinase	Broad spectrum bacterial proteinase, which will rapidly reduce viscosity of soya pastes.
Alkaline Proteinase	Very cost effective alkaline proteinase.
Proteinase	Extraction of chondroitin sulphate from collagenous material such as trachea.
Proteinase	Neutral proteinase broad spectrum.
Proteinase	Highly specific protease for animal protein digestion.

A fall into a ditch makes you wiser.

Chinese Proverb

ENZYME FACTS

- The structure and properties of the enzymes produced by a particular cell are determined by the genetic instructions encoded in the DNA (deoxyribonucleic acid) found in chromosomes of the cell.

- Good manufacturing practice (GMP) is used for enzyme industry. The key issues in GMP are:
 - Microbial control of the microorganism selected for enzyme production
 - Control and monitoring systems ensuring pure cultures and optimum conditions for enzyme yield during fermentation
 - Maintenance of hygienic conditions throughout the recovery and finishing stages.

- The activation energy of a reaction is the amount of energy required to bring all the molecules in one mole of a substance at a given temperature to the transition state at the top of the energy barrier.

- An enzyme captures one or more substrates of a biochemical reaction and brings them into intimate contact as an intermediate complex at an active site containing binding groups (substrate) and catalytic groups (enzyme).

- Enzymes have molecular weights ranging from about 12,000 to over 1 million Daltons and demand physical space for movement and to be able to act on the much smaller functional groups in the substrates.

- At this point there is an equal probability of undergoing reaction to form products or falling back into the pool of unreacted molecules.

- Like other proteins, enzymes are produced inside cells by ribosomes, which link up amino acids into chains.

- Enzymes are true catalysts. They greatly enhance the role of specific chemical reactions that would otherwise occur only very slowly. Catalysis enhance reaction rates by lowering activation energies

- Commercial enzyme products are usually formulated in aqueous solutions and sold as liquids or micro-granules. Formulation has final application in mind.

- In enzyme catalyzed reaction, the binding groups of the substrate and catalytic groups of an enzyme form a complex that has much lower energy content (than an uncatalyzed reaction), meaning the activation energy barrier is much lower (than equivalent uncatalyzed reaction). This provides substrates with enough interval energy to react.

The older I get, the more I distrust the familiar doctrine that age brings wisdom.

- H.L. Mencken



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