

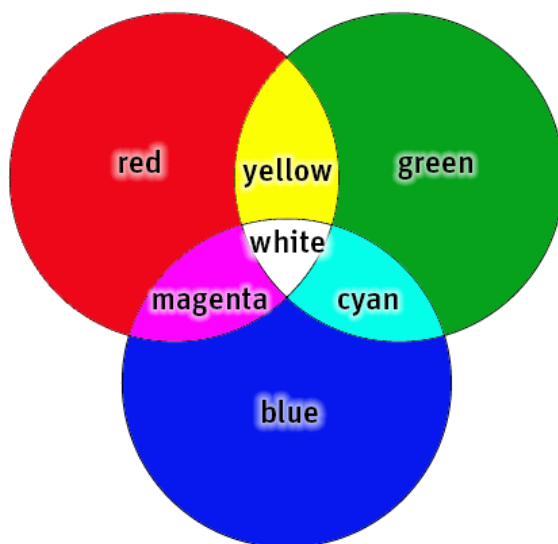
- **Rightfit pigment: Synthetic azopigments to replace toxic organic and inorganic pigments:**

Rightfit azo pigments contain calcium, strontium or barium which replace conventional heavy metal based pigments containing lead, hexavalent chromium or cadmium. Because of their low potential toxicity and very low migration, the high performance organic pigments replace heavy metal based pigments. Engelhard has developed a wide range of environmentally friendly rightfit azo pigments that contain calcium, strontium or sometimes barium instead of heavy metals. True to their name, the rightfit pigments have the right environmental impact, right color space, right performance characteristics and right cost to performance value.



- ♣ Rightfit azo pigments are more resilient to degradation than their common counterparts and when they do degrade, no harmful or bio-accumulative substances are expected to be formed.
- ♣ Rightfit azo pigments eliminate the risk to human health and the environment from exposure to heavy metals such as cadmium, chromium and lead used in the manufacture of cadmium and chrome yellow pigments.
- ♣ They are expected to have very low potential toxicity based on toxicity studies, physical properties and structural similarities to many widely used food colorants. Because of their low potential toxicity and very low migration, most of the Rightfit azo pigments have been approved both by the U.S. Food and Drug Administration (FDA) and Canadian Health Protection Branch (HPB) for indirect food contact applications.

- ♣ In addition, these pigments are manufactured in aqueous medium, eliminating exposure to the polychlorinated intermediates and organic solvents associated with the manufacture of traditional high performance pigments.
- ♣ Rightfit azo pigments have additional benefits, such as good dispersibility, improved dimensional stability, improved heat stability and improved color strength. Their higher color strength achieves the same color values using less pigment.
- ♣ Rightfit azo pigments also cover a wide color range from purple to green shade yellow color. Being closely related chemically, these pigments are mutually compatible, so two or more can combine to achieve any desired intermediate color shade.



**Combining Red, Green and Blue**

- ♣ Rightfit azo pigments meet the essential performance characteristics at significantly lower cost than high performance organic pigments. Thus formulators get the right performance properties at the right cost, resulting in a steadily increasing market for these pigments.
- ♣ Rightfit azo pigments provide environmentally friendly, value added color to packaging used in the food, beverage, petroleum product, detergent and other household durable goods markets.

## THE CLASSIFICATION OF PIGMENTS:

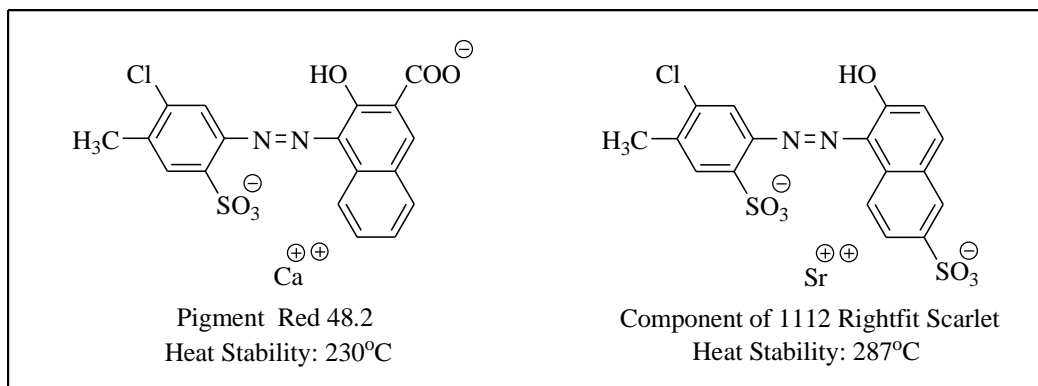
- i. **By Their Origin:** Pigments can be classified by their origin as natural, synthetic or inorganic. Natural pigments are produced by living organisms such as plants, animals, fungi and microorganisms. Synthetic pigments are obtained from laboratories. Natural and synthetic pigments are organic compounds. Inorganic pigments can be found in nature or reproduced by synthesis.
- ii. **By the Chemical Structure of the Chromophore:** Pigments can be classified by taking into account the chromophore chemical structure. Chromophores with conjugated systems: carotenoids, anthocyanins, betalains, caramel etc. Metal coordinated porphyrins: myoglobin, chlorophyll and their derivatives.

### Natural Organic Pigments:

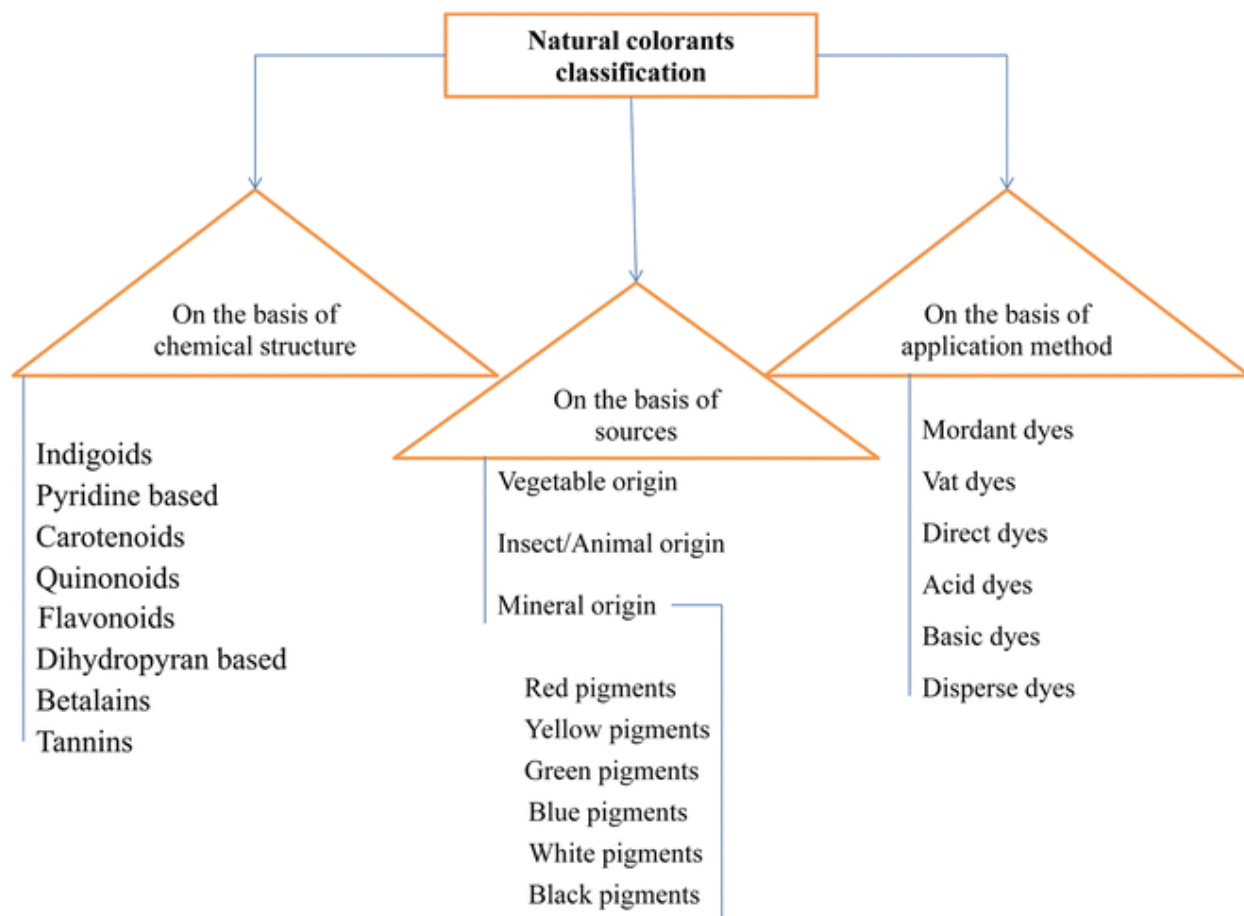
Pigments of this category are derived from animal products and plant products. The use of these pigments are rare due to their poor lightfastness property. Before the beginning of the modern era, the natural organic pigments were considered as an important part of the historical pigments. Earlier these are used for bodily ornaments, textile dyeing and cosmetics. But today a large number of the natural organic dyes have been replaced by the synthetic organic dyes. Therefore, today, these pigments are remembered by their quaint historical names.

### Synthetic Organic Pigments:

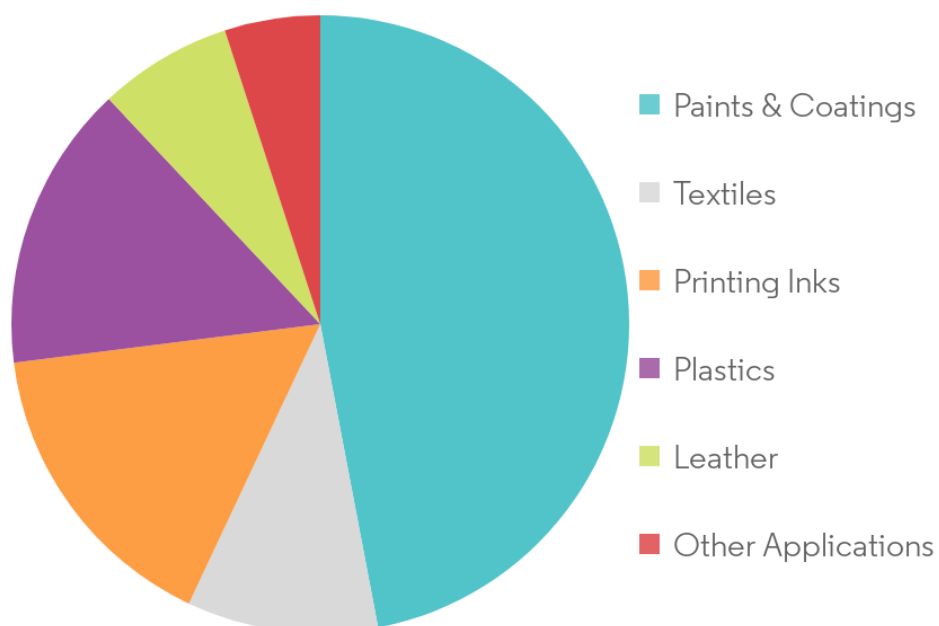
Pigments of this category are carbon based and these are often made from petroleum compounds. Most of the synthetic organic pigments except Carbon Black are not stable and they will wear away at the time of using as a pigment. These atoms have amazing flexibility and ability to form many different structures. Due to this attribute, they are able to form different combinations with other carbon atoms or atoms of other elements or with other compounds. This facilitates it to form almost limitless molecular variations. Out of these large number of carbon made molecules, intense color variations attribute will come in these synthetic organic pigments. Pigments which are formed out of these molecules, are the least toxic and economically beneficial. Azo pigments along with other organic pigments are derived from water soluble dyes.



### Modification of Chemical Structure



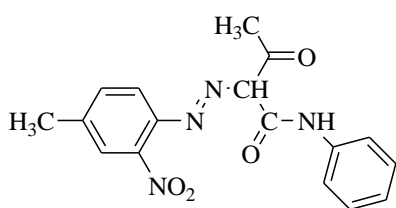
Pigments Market, Revenue Share (%), by Application, Global, 2018



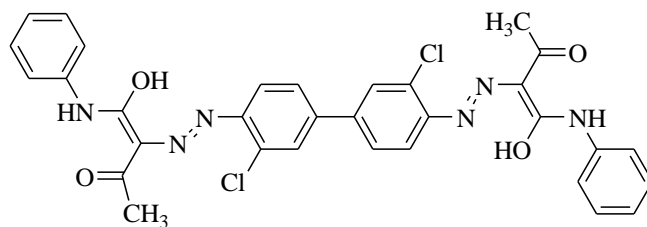
## Yellow Pigments

The most common organic yellow pigments are member of the insoluble azo class of pigments and they belong to the four main classes: monoarylide yellow, diarylide yellow, benzimidazolone yellow and heterocyclic yellow.

The hansa yellow is a bright monoarylide often used in trade sales and emulsion paints. They have low opacity in paint films and are soluble in aromatic solvents.



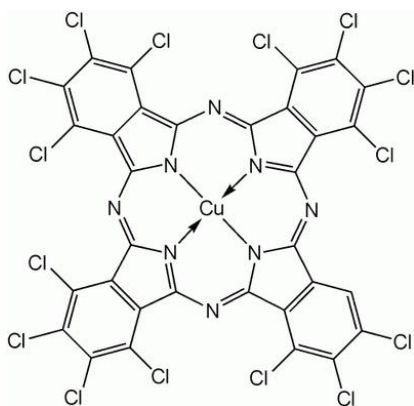
Pigment Yellow 1, Hansa Yellow G



Pigment Yellow 12, Benzidine Yellow G

## Green Pigments

The yellowish green is obtained with nine to ten bromine atoms per molecule. The phthalocyanine greens are economical and have good lightfastness. The excellent stability of these pigments permits their use as colorants in all forms of decorative and industrial coating systems.

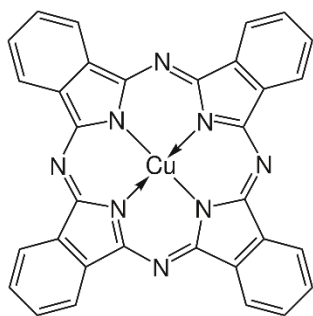


Phthalocyanine Green G



## Blue Pigments

The most common organic blue pigments in the coating industry is copper phthalocyanine. This is bright, versatile pigment of outstanding lightfastness. Phthaloblues are available commercially in three crystal forms: alpha, beta and epsilon. The beta form is most stable. Phthalocyanine pigments are characterized by a high tinting strength and opacity together with excellent color stability on exposure to light. These pigments are also insoluble in most solvents used in paints.



Cu Phthalocyanine

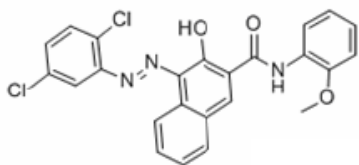


## Red Pigments

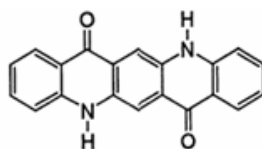
Red iron oxide ( $\text{Fe}_2\text{O}_3$ ) is an organic pigment of either natural or synthetic origin. Synthetic pigment is made by heating iron sulfate with quicklime in a furnace.

Indian red is a naturally occurring mineral whose ferric oxide content may vary from 80 to 95%, the reminder being clay and silica.

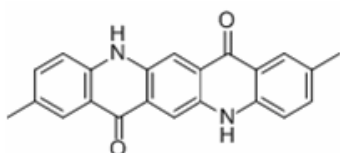
Red lead ( $\text{Pb}_3\text{O}_4$ ) is a brilliant red-orange colored synthetic inorganic pigment used mainly as a protective priming coat for steel work rather than a coloring pigment in paints.



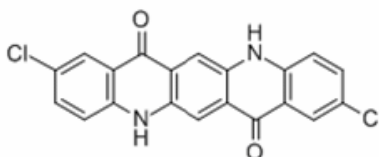
PR9



PR206



PR122



PR202





## Tianlong Organic powder pigment series



Fast yellow  
T511



Fast yellow  
T525



Benzidine  
yellow T538



Fast yellow  
T521



Permanent  
yellow T540



Permanent  
orange T560



Permanent  
orange T526



Permanent  
orange T515



Permanent red  
F3RK T228



Lithol red BK  
T260



Scarlet red  
T232



Fast red  
T218



Permanent red  
F5RK T234



Fast red BBS  
T224



Lithol mauve  
2R T365



Rubber  
scarlet T216



Purplish red  
1171



Violet 21  
HDRS



Permanent  
purple HDBL



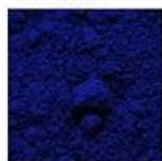
lead chrome  
green T610



Phthalocyanine  
T752



Phthalocyanine  
BSX T712



cyanine BGS  
T782



Malachite Blue  
Lake T723

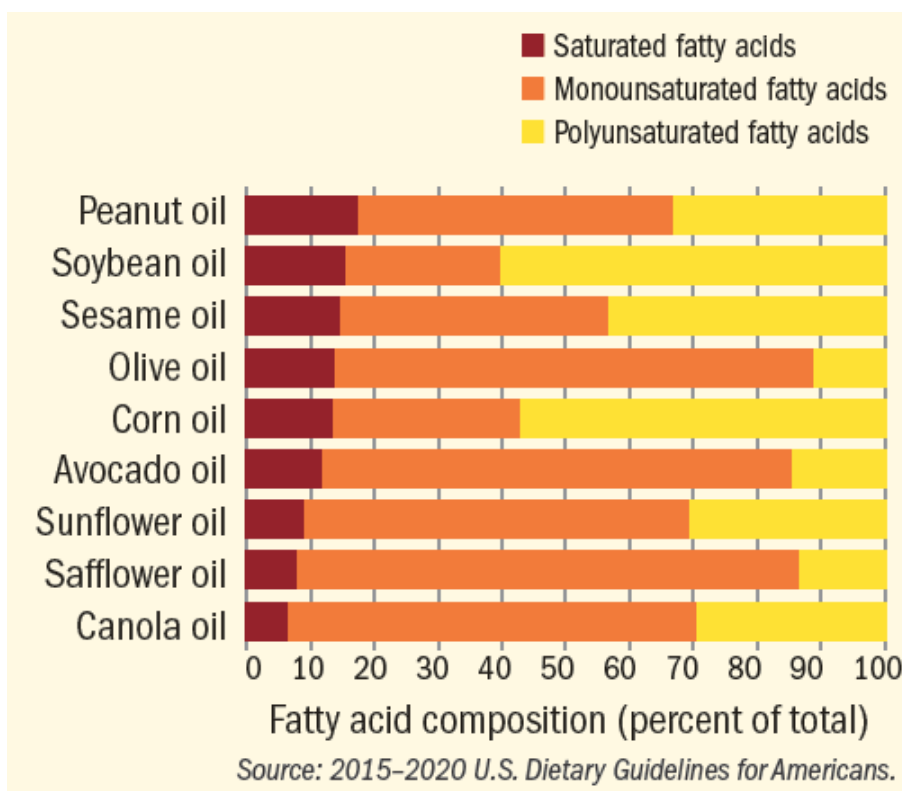


Phthalocyanine  
green T619

- **Healthier Fats and Oil by Green Chemistry:**  
**Enzymatic inter esterification for production of no trans-fats and oils:**

Oils such as corn, sunflower and soybean contain omega-6, a type of polyunsaturated fat that may help to reduce insulin resistance and inflammation. Use naturally occurring, unhydrogenated vegetable oils such as olive, canola, safflower and sunflower oil whenever possible.

It used to be widely accepted: Saturated fat is bad. But some studies suggest that saturated fats in moderation may not be so hard on your heart after all. What's more, replacing saturated fats with the wrong foods such as the refined carbohydrates in white bread, white rice, pastries, candies, and desserts may actually be risky.





## **Five ways to fit fats and oils into your heart-healthy diet::**

### **1. Don't Obsess Over Saturated Fat:**

Health experts told us to eat less saturated fat when they found that it raises LDL, the "bad" cholesterol. High LDL is linked to heart disease. Americans eat about 11.5% of calories from saturated fat. If we cut that roughly in half, to 6.5%, we might lower our risk of heart disease by only about 10%, Mozaffarian says. But during the low-fat craze, many people replaced saturated fat with fat-free products that were high in refined carbohydrates. That switch may end up raising their risk for heart problems.

So can we eat as much butter and cheese as we like? No. The American Heart Association still recommends that no more than 7% of all your calories come from saturated fat, which is found mainly in fatty meats and dairy foods.

### **2. Choose Heart-Healthy, Plant-Based Oils:**

Most experts still agree that it's smart to swap out some saturated fats for unsaturated fats. Olive oil and canola oil are better choices than butter, for instance. But there's plenty of debate about the healthiest type of oil. Vegetable oils typically mix two types of fat: polyunsaturated and monounsaturated. Olive oil is mostly a monounsaturated fat. Corn and soybean oils are mostly polyunsaturated. Canola oil is unusual among vegetable oils because it has omega-3 fatty acids, like those found in fish oil.

We may want to use a variety of plant-based oils. That's good for cooking and flavor, as well. Olive oil, with its rich flavor, is great for salad dressings, for drizzling over pasta, or for dipping bread. Peanut oil and sesame oil also have rich flavors. But all three of these oils smoke and lose flavor at high temperatures. Canola and sunflower oils are better for cooking because they have high smoke points. Also, canola oil has very little flavor of its own, so it won't overwhelm other ingredients.

### **3. Get Plenty of Omega-3 Fats:**

There's no debate about the need to get enough omega-3s. Found in fish oil, omega-3s protect against abnormal heart rhythms. They help keep blood vessels flexible, which lowers your risk for a heart attack or stroke. Aim for at least two servings a week of a fatty fish such as salmon, sardines, lake trout, or albacore tuna. Walnuts, flax seed, basil seed and canola oil also offer omega-3s, though it's a less potent type.

#### 4. Avoid Trans Fats:

Skip artificial trans-fat completely. It raises bad cholesterol and lowers good cholesterol. It can also boost inflammation, which is linked to heart disease, stroke, diabetes, and other chronic diseases.

#### 5. Put Fats in Perspective:

Fats are an important part of a healthy diet, especially unsaturated fats. The Mediterranean diet gets 30% or more of its calories from fat. It's widely considered one of the healthiest eating patterns in the world. Much of the fat in the Mediterranean diet comes from olive and other plant-based oils, as well as from fish.

"With the focus on low-fat, we lost track of that. A good diet isn't about percentages of fatty acids, but about an overall healthy eating pattern." Eat a mix of fruits, vegetables, whole grains, fish, lean meats and poultry, and healthy fats for a balanced diet.



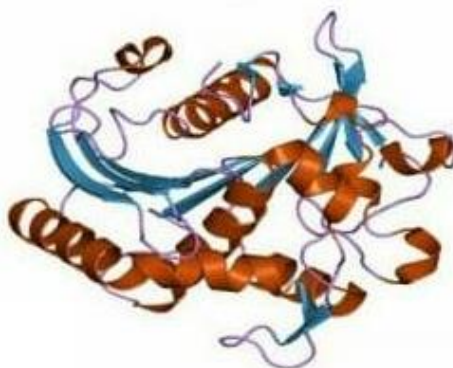
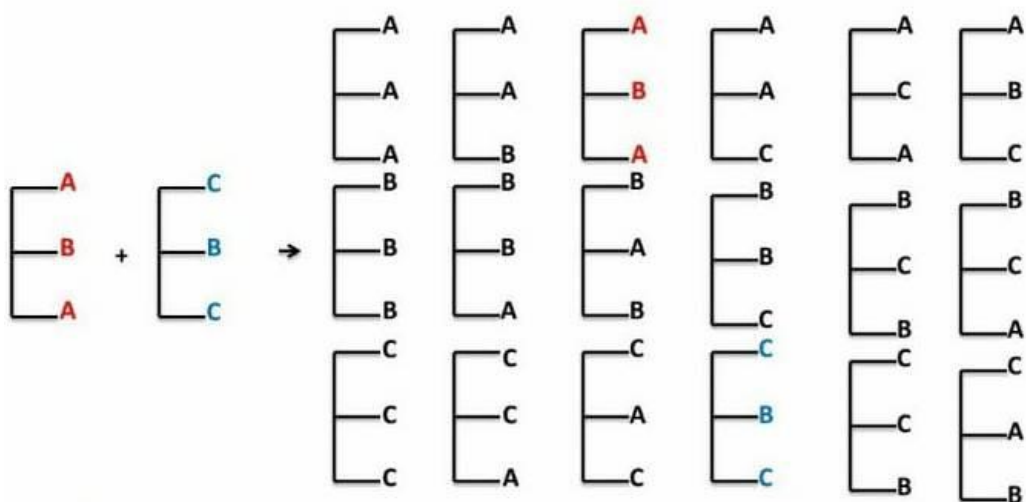
*Foods for healthy diet plan*

## Enzymatic interesterification: Interzym:

Interesterification is a chemical reaction that induces the rearrangement of fatty acids within and between triacylglycerols. In food industry, interesterification can be carried out using a chemical catalyst or an enzyme. Sodium methoxide is generally used as a catalyst in chemical esterification, while lipase is used in enzymatic esterification. Chemical esterification is a random reaction while enzymatic esterification can be random or regiospecific.

De Smet has developed an enzymatic interesterification technology, called Interzym, in collaboration with the company Novozymes (Denmark). Enzymatic interesterification is an efficient way of controlling the melting characteristics of edible oils and fats. This is done by controlling the degree of conversion/reaction. No chemicals are used in the process and no trans fats are formed as in other production methods. Until recently the technology was not widely used due to the high cost of the enzyme, but now the application using the enzyme Lipozyme® TLIM is a cost-effective alternative to both chemical interesterification and hydrogenation.

### Triacylglycerol mixture before and after chemical interesterification



## The benefits of Interzym are:

- **It's a cost-efficient process:**

Neither washing nor bleaching of the interesterified fat is required, as the low temperature enzymatic process produces no side-products.

- **The capital investment costs are lower:**

The Interzym investment costs are lower than those of both hydrogenation and chemical interesterification.

- **It's a simple and easy process:**

A specific melting profile of the fat is achieved by passing the oil once through the enzyme column.

- **No trans fatty acids are produced:**

Interzym produces no trans fatty acids, which are believed to have a negative impact on our health.

- **It allows for a wide range of end-products:**

Interzym enables very accurate control of the process, which allows specific melting profiles to be achieved. This means that products with new and improved melting profiles can be produced.

- **It improves industrial hygiene or safety:**

Contrary to both hydrogenation and chemical interesterification, Interzym requires no chemicals. The enzyme is fixed in the column throughout the production, so the only handling of the enzyme is when it is changed after production. Enzymes are not hazardous to the environment nor dangerous to handle.

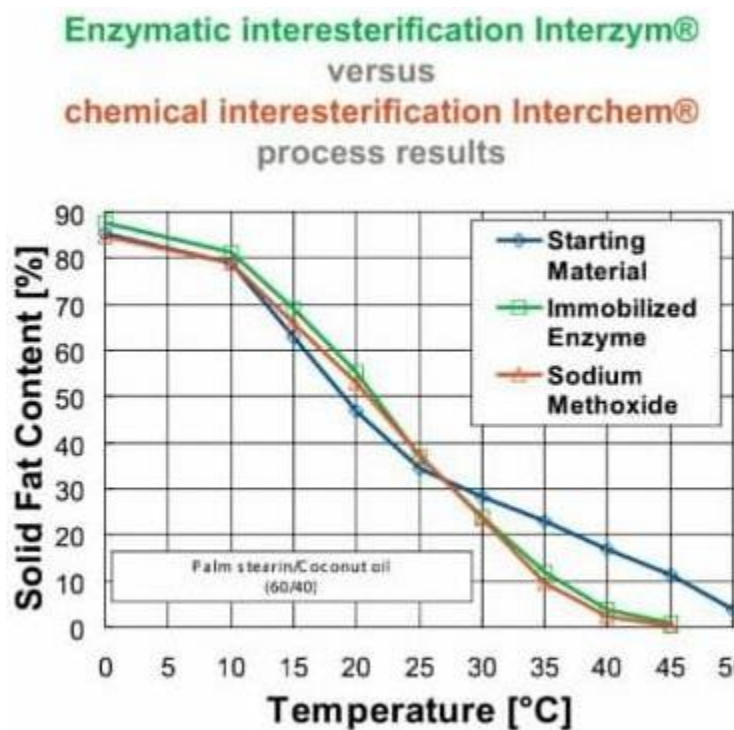
- **More natural fat is produced:**

The catalyst in Interzym is a 1,3-specific lipase. The enzymes rearrange the fatty acids in the 1- and 3-positions (the 2-position is preserved). In chemical interesterification, all three position are shifted randomly.



## Comparison of interesterification methods

Chemical interesterification	Enzymatic interesterification
Low processing cost (batch reactor)	High processing cost (continuous plug-flow reactor, lipase)
High processing loss (oil saponification)	Minimum processing loss
Low oxidative stability (tocopherol loss)	No change in oxidative stability
High levels of reaction by-products (MAG, DAG, glycerol)	Low levels of reaction by-products
Flavor reversion problem	No flavor reversion
Highly reproducible and easily controlled	More complex operation and control



**New interzyme pilot plant**



## 10 High-Fat Foods That Are Actually Super Healthy:

Ever since fat was demonized, people started eating more sugar, refined carbs and processed foods instead. As a result, the entire world has become fatter and sicker. However, times are changing. Studies now show that fat, including saturated fat, isn't the devil it was made out to be. All sorts of healthy foods that happen to contain fat have now returned to the "superfood" scene. Here are 10 high-fat foods that are actually incredibly healthy and nutritious.



### 1. Avocados:

The avocado is different from most other fruits. Whereas most fruits primarily contain carbs, avocados are loaded with fats. In fact, avocados are about 77% fat, by calories, making them even higher in fat than most animal foods. The main fatty acid is a monounsaturated fat called oleic acid. This is also the predominant fatty acid in olive oil, associated with various health benefits. Avocados are among the best sources of potassium in the diet, even containing 40% more potassium than bananas, a typical high potassium food. They're also a great source of fiber, and studies have shown that they can lower LDL cholesterol and triglycerides, while raising HDL (the "good") cholesterol. Even though they are high in fat and calories, one study shows that people who eat avocados tend to weigh less and have less belly fat than those who don't.



## 2. Cheese:

Cheese is incredibly nutritious. This makes sense, given that an entire cup of milk is used to produce a single thick slice of cheese. It is a great source of calcium, vitamin B12, phosphorus and selenium, and contains all sorts of other nutrients. It is also very rich in protein, with a single thick slice of cheese containing 6.7 grams of protein, same as a glass of milk. Cheese, like other high-fat dairy products, also contains powerful fatty acids that have been linked to all sorts of benefits, including reduced risk of type 2 diabetes.



## 3. Dark Chocolate:

Dark chocolate is one of those rare health foods that actually taste incredible. It is very high in fat, with fat at around 65% of calories. Dark chocolate is 11% fiber and contains over 50% of the RDA for iron, magnesium, copper and manganese. It is also loaded with antioxidants, so much that it is one of the highest scoring foods tested, even outranking blueberries. Some of the antioxidants in it have potent biological activity, and can lower blood pressure and protect LDL cholesterol in the blood from becoming oxidized. It is very effective at improving cardiovascular health. Studies also show that people who eat dark chocolate 5 or more times per week are less than half as likely to die from heart disease, compared to people who don't eat dark chocolate. There are also some studies showing that dark chocolate can improve brain function, and protect your skin from damage when exposed to the sun. Just make sure to choose quality dark chocolate, with *at least* 70% cocoa.



## 4. Whole Eggs:

Whole eggs used to be considered unhealthy because the yolks are high in cholesterol and fat. In fact, a single egg contains 212 mg of cholesterol, which is 71% of the recommended daily intake. Plus, 62% of the calories in whole eggs are from fat. However, new studies have shown that cholesterol in eggs doesn't affect the cholesterol in the blood, at least not in the majority of people. Whole eggs are actually loaded with vitamins and minerals. They contain a little bit of almost every single nutrient we need. They even contain powerful antioxidants that protect the eyes, and lots of choline, a brain nutrient that 90% of people don't get enough of. Eggs are also

a weight loss friendly food. They are very fulfilling and high in protein, the most important nutrient for weight loss. Despite being high in fat, people who replace a grain-based breakfast with eggs end up eating fewer calories and losing weight. The best eggs are omega-3 enriched or pastured. Just don't throw away the yolk, that's where almost all the nutrients are found.



## 5. Fatty Fish:

One of the few animal products that most people agree is healthy, is fatty fish. This includes fish like salmon, trout, mackerel, sardines and herring. These fish are loaded with heart-healthy omega-3 fatty acids, high quality proteins and all sorts of important nutrients. Studies show that people who eat fish tend to be much healthier, with a lower risk of heart disease, depression, dementia and all sorts of common diseases. If one can't (or won't) eat fish, then taking a fish oil supplement can be useful. Cod fish liver oil is best, it contains all the omega-3s that we need, as well as plenty of vitamin D.



Salmon



Trout

## 6. Nuts:

Nuts are incredibly healthy. They are high in healthy fats and fiber, and are a good plant-based source of protein. Nuts are also high in vitamin E and loaded with magnesium, a mineral that most people don't get enough of. Studies show that people who eat nuts tend to be healthier, and have a lower risk of various diseases. This includes obesity, heart disease and type 2 diabetes. Healthy nuts include almonds, walnuts, macadamia nuts and numerous others.





## 7. Chia Seeds:

Chia seeds are generally not perceived as a "fatty" food. However, an ounce (28 grams) of chia seeds actually contains 9 grams of fat. Considering that almost all the carbs in chia seeds are fiber, the majority of calories in them actually comes from fat. In fact, by calories, chia seeds are around 80% fat. This makes them an excellent high-fat plant food. These aren't just any fats either, the majority of the fats in chia seeds consists of the heart-healthy omega-3 fatty acid called ALA. Chia seeds may also have numerous health benefits, such as lowering blood pressure and having anti-inflammatory effects. They are also incredibly nutritious. In addition to being loaded with fiber and omega-3s, chia seeds are also packed with minerals.



## 8. Extra Virgin Olive Oil:

Another fatty food that almost everyone agrees is healthy, is extra virgin olive oil. This fat is an essential component of the Mediterranean diet, which has been shown to have numerous health benefits. Extra virgin olive oil contains vitamins E and K and is loaded with powerful

antioxidants. Some of these antioxidants can fight inflammation and help protect the LDL particles in the blood from becoming oxidized. It has also been shown to lower blood pressure, improve cholesterol markers and have all sorts of benefits related to heart disease risk. Out of all the healthy fats and oils in the diet, extra virgin olive oil is the king.



## 9. Coconuts and Coconut Oil:

Coconuts, and coconut oil, are the richest sources of saturated fat on the planet. In fact, about 90% of the fatty acids in them are saturated. Even so, populations that consume large amounts of coconut do not have high levels of heart disease, and are in excellent health. Coconut fats are actually different than most other fats, and consist largely of medium chain fatty acids. These fatty acids are metabolized differently, going straight to the liver where they may be turned into ketone bodies. Studies show that medium-chain fats suppress appetite, helping people eat fewer calories and can boost metabolism by up to 120 calories per day. Many studies show that these types of fats can have benefits for people with Alzheimer's and they have also been shown to help you lose belly fat.



## 10. Full-Fat Yogurt:

Real, full-fat yogurt is incredibly healthy. It has all the same important nutrients as other high-fat dairy products. But it's also loaded with healthy, probiotic bacteria, that can have powerful effects on your health. Studies show that yogurt can lead to major improvements in digestive health and may even help fight heart disease and obesity. Just make sure to choose real, full-fat yogurt and read the label. Unfortunately, many of the yogurts found on store shelves are low in fat, but loaded with added sugar instead.





## • Future Trends in Green Chemistry:

Future Trends in Green Chemistry includes oxidation reagent and catalysis comprised of toxic substances such as heavy metals showing substantial negative effect on human health and environment which can be changed by the use of benign substances. Non-covalent derivatization, supramolecular chemistry research is currently on going to develop reactions which can proceed in the solid state without the use of solvents. Biometric multifunctional reagents, combinatorial green chemistry is the chemistry of being able to make large numbers of chemical compounds rapidly on a small scale using reaction matrices. Proliferation of solvent less reactions helps in development of product isolation, separation and purification that will be solvent-less as well in order to maximize the benefits.

- ♣ Green Nanochemistry
- ♣ Supramolecular Chemistry
- ♣ Oxidation Reagents and Catalysts
- ♣ Biometric Multifunctional Reagents
- ♣ Combinatorial Green Chemistry
- ♣ Non Covalent Derivatization Techniques



Leave a Big positive footprint