

RAW SCIENCE

RAW BIOCHEM
Nature's Chemistry

The world-wide petrochemical market is approaching \$1 trillion/year (USD) with nearly doubled demand since 2000. The sector now consumes 14% of daily global oil use and 8% of gas. It also accounts for 18% of the global total of industrial carbon dioxide emissions and contributes 10m tonnes of waste each year.

A PETROCHEMICAL ANTIDOTE

RAW's unique product solutions counter the need for caustic and hazardous chemicals without sacrificing the strength required to complete even the most difficult tasks. These products are already being used in a wide range of industries to great acclaim.

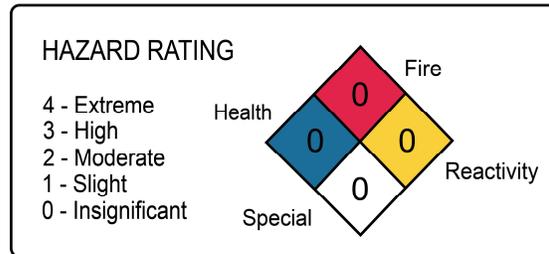
Whether it is the oil and gas industry where hydrocarbon recovery and processing create its own set of dangerous consequences and issues, the food processing sector struggling with bio-film and bacteria counts or simple janitorial functions; RAW products address these and every other industrial segment with powerful antidotes to the use of petrochemicals.

Harnessing the power of micelle!

Their strength relies on an ability to harness the power of micelle in a colloidal solution. The extremely high surface area to volume ratio

enables micelles to penetrate complex carbon molecules and emulsify organic matter.

RAW's nano-technology inspired solutions are derived from domestically grown, readily biodegradable ingredients and carry an enviable ZERO hazard rating.



RAW Biochem:

- Powerful alternatives to petrochemicals
- Budget sensitive
- Safe for Humans &
- Environmentally Responsible

RAW Biochem formulations contain food grade ingredients such as soy, corn, grain, potatoes and trees which are processed to form particles called a "micelle".

MICELLE

The micelle's small particle size (1-4 nano-meters), combined with its extremely high surface area to volume ratios enables it to penetrate complex carbon molecules and emulsify organic matter.

Large surfactant molecules require more time to arrange at the interface whereas RAW's small molecules quickly arrange at the interface to perform their respective tasks.

These micelles are comprised of a collection of linear molecules of fatty esters and fatty acids clumped together in the shape of a sphere that is about the size of 20 hydrogen atoms.

Micelles are activated when mixed with water or alternative liquids such that each micelle is then completely surrounded by a thin layer of liquid molecules. Colloidal micelle solutions remain suspended indefinitely and will not settle-out.

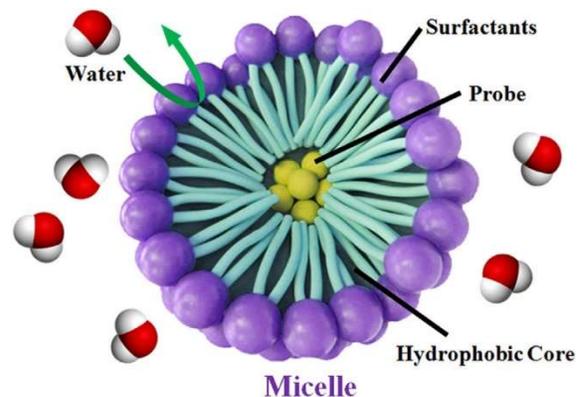
Nano-sized micelle break long-chain molecules

This is due to a process known as Brownian motion and defined as the random movement of colloidal particles suspended in a liquid or gas, caused by collisions with molecules of the surrounding medium. The outer hydrophilic shell aggressively searches for and bonds with liquid

molecules which in turn makes them hyper-mobile.

RAW colloidal micelles work to breakdown tight carbon bonds in fats, oils and grease (FOG) and holds them in suspension. Individual colloidal micelles at the nano-scale, repel each other like opposing magnets while attracting solid particles and breaking down carbon bonds into smaller molecules and/or atoms.

The micelle has a hydrophilic (*water seeking*) pole and a hydrophobic (*water repelling*) pole. The hydrophobic poles attract each other, thus forming the interior of the micelle. The hydrophilic poles form a tough outer surface. When a micelle comes in contact with a carbon molecule, the centre of the micelle bonds to a



similar hydrophobic carbon molecule. The result is a disruption in the attraction to the other hydrocarbon molecules and/or the surface.

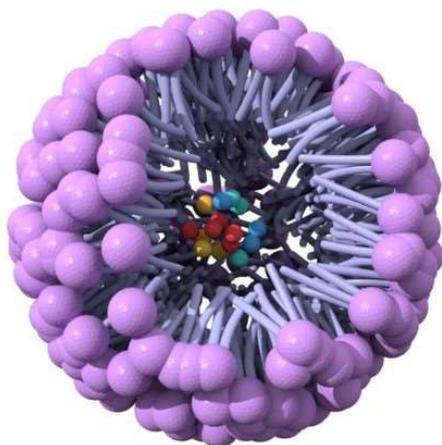
The action of a single micelle is multiplied by billions more which results in molecular emulsification. The process allows micelle to penetrate highly viscous and sticky materials and lift them from the surface to which they are adhered. This offers inherent advantages including reduced applications rate, more rapid and reliable activation and extended long-term affect.

All RAW Biochem ingredients and products are classified as non-reactive. They will not form new or unwanted chemicals and compounds through an association with various other types of natural or man-made chemicals.

The underlying foundation to all RAW products is readily biodegradable, non-toxic surfactants.

Surfactants (*Surface Active Agents*) form masses with a Lipophilic (*oil-compatible*) tail and Hydrophilic (*water-compatible*) head which enables solvents (*active ingredients*) and other ingredients to be applied in unison rather than as separate processes.

Solvents contained within RAW formulations enable surfactants to penetrate through the FOG (*Fats, Oils & Grease*) to the water interface (*water, hydrocarbon, glycols*).



At the interface, surfactants reduce the surface tension which allows the fat, oil or grease to separate from other FOG components or other substrates and surfaces. The liberated FOG components enter the water as tiny droplets.

In many cases the surfactant has also been designed as a demulsification agent which in turn forces these now emulsified FOG particles to be lifted to the surface for immediate recovery.

After demulsification, the remaining colloidal solution can remain in-situ for repeated use, or can be disposed of through standard discharge protocols.

NON-REACTIVE

Disposal processes should follow local municipal guidelines and regulations.

This non-reactive nature enables the creative design of alternative formulations which can perform new and increasingly difficult tasks by multi-tasking or by working in unison.

RAW products will not create new and unwanted compounds!

Their inability to chemically “react” offers the opportunity to design formulations which continue to perform their original function even with additional ingredient components. This new recipe will now carry on multiple diverse functions within the same application process.

It may as an example remove or separate adhered FOG components from a variety of substrates while concurrently scavenging H₂S as well as removing mineral scale/calcium build-up.

This new non-reactive formulation may also incorporate petrochemicals or other man-made compounds without negatively impacting the original non-reactive ingredients.

At RAW Biochem, we are using nature's ingredients to solve problems.

It's called "Bio-utilization"!

HISTORY

Man's use of nature to overcome problems can be traced back to the early 1800's when pyrethrum flowers (*Chrysanthemum's*) were used as insecticides. By 1828 this earliest insecticide was being used extensively in Persia, Yugoslavia and even imported to the US for this purpose.

The origin of colloidal chemistry can be traced to the 1880's when it was evolved by David Graham, a British chemist. This discovery was so monumental that 50 years later one of the world's great scholars publicly enthused "There is as I see it, just one great development left for our time. That is in the understanding of colloidal metals. It is the "Fourth Estate of Matter", the other three being land, water and air".

Agriculturists, scientists and industrial leaders coined the term Chemurgy to describe the use of farm products for industry

Early leaders included Henry Ford who claimed every car had at least a bushel of soybean in it.

The science of "green" chemistry soon waned and eventually lapsed as major discoveries of oil & gas combined with breakthrough's in catalytic cracking with an almost endless supply of oil became available to create new compounds which became known as chemicals.



Recent gains in our knowledge and understanding of "the science" have launched the green chemical and lubricant industry into the forefront through a better understanding of bio-based ingredients.

"Nature's Chemistry"

As an example, the electron microscope has enabled researchers to view ingredients at the molecular level.

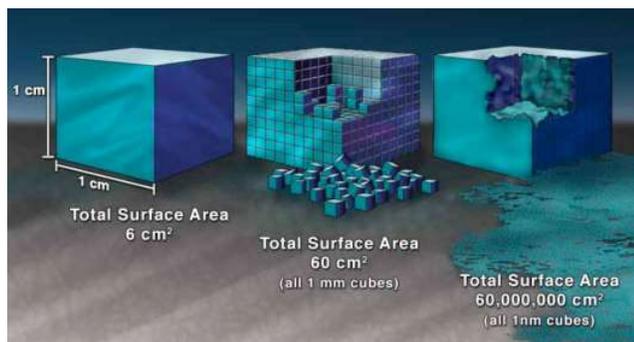
This; combined with a greater understanding of plant characteristics has permitted green chemistries and lubricants to make great strides forward to where they are now able to perform tasks which in many cases are not achievable through conventional petrochemicals.

Nano-technology is a term defined as particles with dimensions of between 1 – 100 nano-meters (*nm*).

To put that in perspective;

- A human hair is between 50-100,000 nm.
- Your DNA is ~ 2nm
- Your fingernails grow 1 nm/second

A solid cube of a material 1 cm on each side has 6 square centimeters of surface area, about equal to one side of half a stick of gum. But if that volume of 1 cubic centimeter of volume is filled with 1-nanometer-sized cubes— 10^{21} of them, their total surface area comes to 6,000 square meters.



In other words, a single cubic centimeter of cubic nanoparticles has a total surface area one-third larger than a football field when reduced to nano-size!

At this scale, many of the properties which you have been taught are true or are visible at the physical level significantly change.

This is the point where so-called quantum effects rule the behavior and properties of particles.

When particle size is made to be nanoscale, properties such as melting point, fluorescence, electrical conductivity, magnetic permeability, and chemical reactivity change as a function of the size of the particle.

Several examples of these changes include:

- Gold at the nano-scale is a deep pink or rose colour

NANO-TECHNOLOGY

- At the physical level positive magnetic poles are attracted to negative poles but like poles are attracted to each other at the nano-scale.

Nano-technology is integral to the success and efficacy of RAW Biochem products but are also playing a major part in many of the advancements we are seeing in industry.

Scientists are improving solar cells by adding nano-scale texture that traps light so that less is reflected away allowing more to be converted into energy.

Engineers have made nano-scale wearable sensors for plants enabling measurements for water use in crops.

In medicine, nano-technology is being adapted to deliver medicine directly to cancer cells and minimizing damage to healthy tissue.

In transportation, cars have nano-enabled stronger car parts, rechargeable batteries, cleaner exhaust and materials for better temperature control.

Nanotechnology surrounds us and we use its benefits everyday.

Product strength and efficacy is only part of the story! HR & Environmental budgets will thank you too

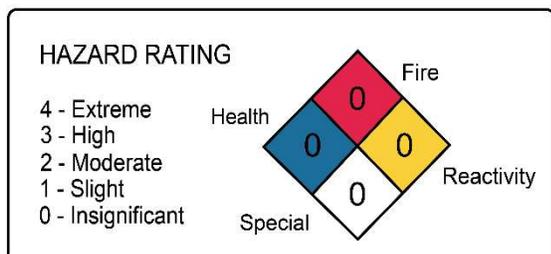
RAW Biochem:

- Non-reactive
- Non-toxic
- Non-flammable
- No VOC's
- Non-corrosive
- Non-caustic
- Non-hazardous
- Non-comedogenic

Improved HR budgets!

The benefits of RAW's extraordinary ZERO hazard rating will reduce or eliminate:

- Worker liability premiums
- Personal protective equipment
- Sick days & time off from chemical injuries
- Handling, transportation and storage costs



Extended Equipment Life

RAW's safe-to-use products are also easy on valuable equipment components. They will not damage, scar or harm substrates while they complete their tasks.

- Extend equipment duty cycles and increase operational hours.
- Reduce parts and infrastructure replacement costs
- Maximize valuable employees by minimizing maintenance costs.

HR & ENVIRONMENTAL



Environmental Remediation Budgets

If remediation budgets are at the tipping point, RAW chemicals will help!

The readily biodegradable status carried by all RAW products allow them to biodegrade to their natural state within 28 days when exposed to sunlight, water and microbial activity.

- Environmental budgets are reduced
- Transportation and disposal costs are lessened
- GHG emissions are less intense
- Discharge fees are minimized
- On-site hazard safety measures are mitigated

GREAT BENEFITS

BOTTOM LINE: Competitively priced RAW formulations perform at superior levels and add bottom line value to your operations.

SUPERIOR EFFICACY: These proprietary nano-technology formulations are proven to perform tasks petrochemicals are unable to complete.

WORKER SAFETY: The RAW advantage includes fewer days lost from health and safety issues when using SAFE nano-technology products.

The ENVIRONMENT: Products meet or exceed all of the guidelines and regulations for environmental safety through **GREEN** ingredients.

PEACE OF MIND: Eliminates trade offs between budgets, environmental consequences or healthy and safety programs

CUSTOM SOLUTIONS: Can't find what you are looking for? Ask us! If we don't already have the answer you are looking for, we will create one.



RAW