

ENZYMES AND MICROORGANISMS- A SUSTAINABLE ALTERNATIVE

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WHY DO YOU CARE?

Green chemistry can reduce material and energy consumption, reduce CO₂ emissions and lower harmful impacts on the environment.



Bioremediation

(reduce toxic organic material, to harmless CO_2 , O_2 or $NaCl$)

Biological agents

Biodegradation
(break down complex compounds into simpler products)

Enzymes

Microorganism

Nutrients

Bioremediation

With the help of Biologic agents such as Enzymes

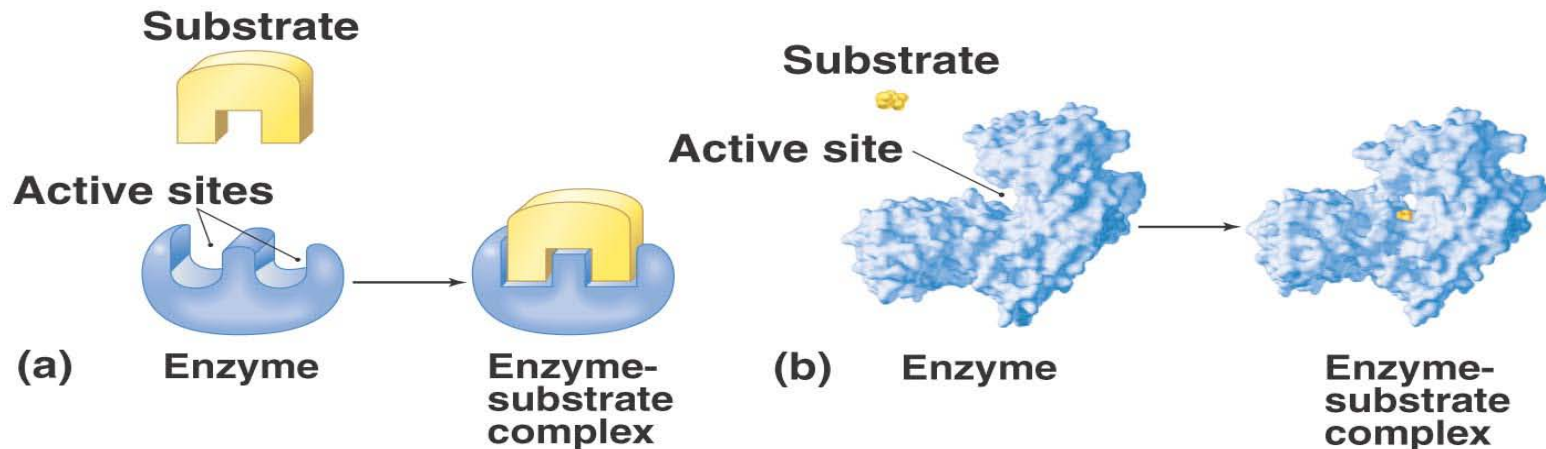
- Cleans marine oil spills;
- Helps clean up land oil spills
- Pesticides and hazardous waste
- Benefits
 - Saving money
 - Being ecologically sound
 - Destroying contaminates
 - Treating waste on site.



WHAT IS AN ENZYME?

An enzyme is a biomolecule (a molecule inside of living organisms) that increases the rate of a reaction.

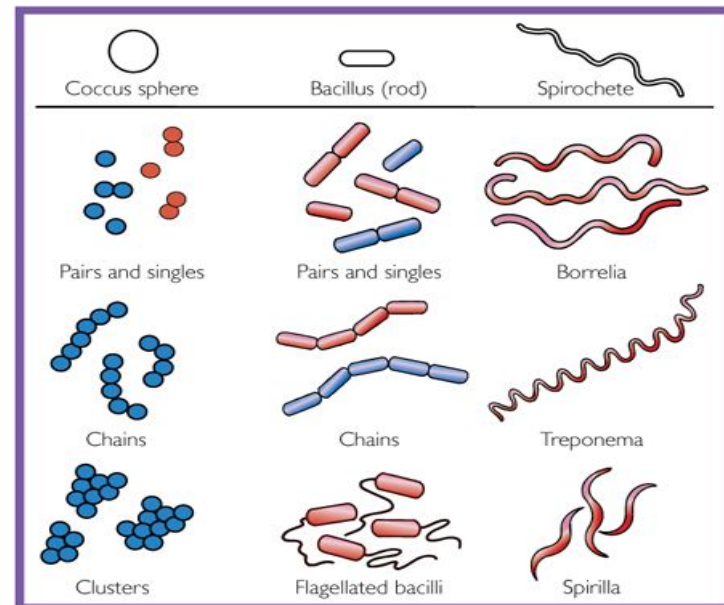
Increasing the rate of reaction is important because reactions that would normally take long periods of time can be done in a relatively short time.



WHAT IS A MICROORGANISM?

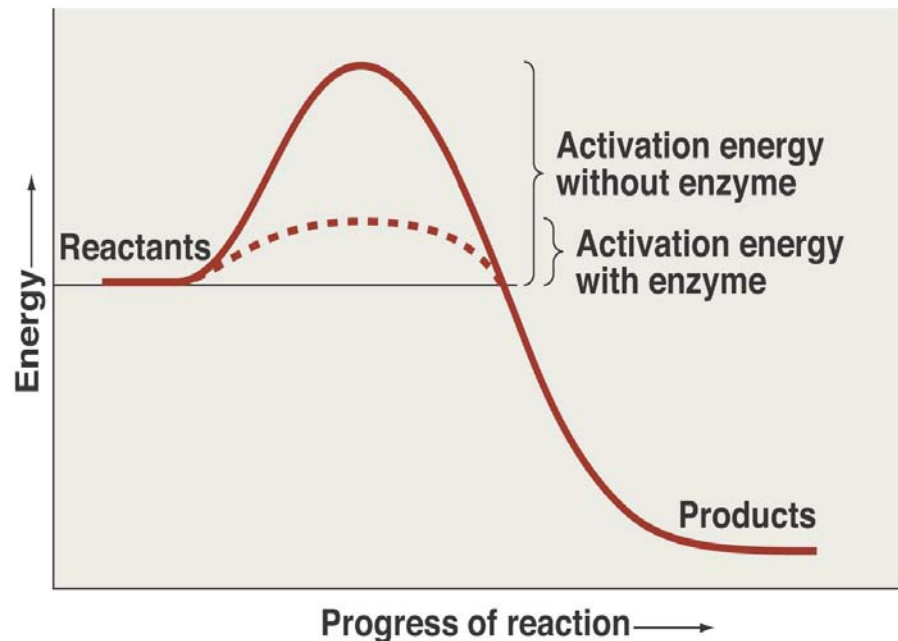
A microorganism is an extremely small living organism. For the purposes of sustainability, microorganisms can provide alternatives to chemicals and other environmentally harsh products in many aspects of life.

Enzymes act as a catalyst
which will increase the
rate of the reaction



How Enzymes work

- In order for a chemical reaction to occur, atoms or molecules must collide. Other factors:
 - how much energy is needed
 - whether the active sites collide the speed of the molecules when they collide.
- The reactions could speed up if high temperature or pressure is applied.
- Enzymes lower the activation energy without increasing temperature or pressure by moving the Components of the reactions together.



Why use enzymes?

- Enzymes in combination with bacteria is used to clean up Oil spills
- Blend of bacteria and enzymes that help keep drains and plumbing clean
- Enzymes is a natural way to clean up the pool water and scum around your pool
- Enzymes deliver stain removal, whiteness, and color and fabric in laundry
- Enzymes also remove difficult and dried-in soils from dishes

Benefits of Enzymes

- ◉ Better cleaning performance
- ◉ Shorter washing times as a detergent
- ◉ Reduced energy consumption
- ◉ Reduced water consumption through higher cleaning efficiency
- ◉ Minimal environmental impact because enzymes are biodegradable

LET'S EXAMINE...

These products can replace environmentally costly household cleaners.



LAUNDRY DETERGENT

Enzymes have the same power to remove stains, increase whiteness, and keep color and fabric quality in an environmentally-friendly manner. Enzymes clean efficiently at lower wash temperatures and shorter wash cycles. Thus, the benefit is two fold: no harsh chemicals, and less usage of resources.



DISHWASHING

Enzymes effectively meet demands as they remove stuck-on food from dishes while leaving glassware with a shine. In this way, no chemicals will be dumped into the water supply.



TOILET CLEANING

Enzymes can be used on tough bathroom stains and soils. They are safe for most surfaces, yet removes build-up of soap scum, tooth paste, and other stains and soils that cannot be removed by other cleaners.



SEPTIC TANK UPKEEP



Microorganisms can be used to keep your septic tank in good condition. Novozymes' products improve waste degradation in septic tanks and eliminates odors due to organic buildup. It contains a blend of highly-specialized microorganisms formulated to provide accelerated degradation of organic compounds in septic systems.

THE FUTURE

Products that are environmentally sustainable will be the products of the future, with availability today. Green chemistry can reduce material and energy consumption, reduce CO₂ emissions and lower harmful impacts on the environment.

WORK CITED

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