

Detergents

The term "detergent" is commonly used to describe synthetic substitutes for soap, but in a broader sense, any substance that can serve as a cleaning agent is referred to as a detergent. The essential elements that contribute to the cleaning capabilities of detergents encompass surfactants containing bleach-activating ingredients, fillers, foaming agents, stabilizers, builders, fragrances, soil-suspending agents, enzymes, colorants, optical brighteners, bactericidal agents, and various other compounds. Incomplete degradation of surfactants can lead to the formation of extensive foam in streams and rivers near dams. Surfactants can only be broken down under specific conditions, such as the introduction of specialized microorganisms for their decomposition.

Detergent in water

One of the consequences of a high concentration of detergents in aquatic environments is the formation of a surface foam layer on water bodies. This occurrence hinders the transfer of oxygen from the air into the water, ultimately leading to impaired oxygen absorption by aquatic organisms. The decline in dissolved oxygen levels due to the mortality and decomposition of algae is a critical factor affecting the survival of aquatic organisms and diminishing biodiversity within the ecosystem. The constituents found in detergents are responsible for modifying the physical and chemical characteristics of natural waters, including factors like temperature, salinity, turbidity, and pH.

Eutrophication, which results from the discharge of detergents into water bodies, is primarily caused by the elevated presence of phosphates. This causes excessive nutrient levels in the water, promoting the rapid growth of algae and other aquatic plants, a phenomenon known as an **algal bloom**. As these algae and plants die and decompose, they consume oxygen from the water during the decomposition process. This leads to a depletion of dissolved oxygen levels in the water, which can be harmful to aquatic organisms such as fish, seaweed, corals and other aquatic life.

Moreover, apart from the direct impact of detergents on aquatic ecosystems, the declining populations of marine plants can indirectly jeopardize sea species that rely on them for sustenance, shelter, protection, or breeding grounds.

Detergent in soil

Contaminated water has the potential to infiltrate the soil and adversely impact the local soil flora. Elevated levels of salt and surfactants can gradually deteriorate the soil structure, with detrimental consequences for plant well-being.

When soil is irrigated with water containing detergent components, it can elevate the soil's electrical conductivity over time, leading to increased soil salinity. This may eventually cause the soil to become water-repellent, thereby reducing its capacity to retain and store water.

Detergent consumption

Industrial laundries rank among the significant consumers of both fresh water and detergents, generating approximately 40 cubic meters of wastewater daily for each washing machine in operation. The wastewater generated during a laundry cycle contains a mixture of organic and inorganic contaminants, with varying proportions of mineral oil depending on

the textile being treated. These substances, in conjunction with detergents, collectively contribute to environmental pollution.

Eco-sustainable solutions

There are some brands that certify that detergents are produced using organic methods and supply chains and that their disposal has the least possible impact. These certifications are provided by companies that ensure the monitoring of these processes. Two of these are "ICEA" and "EU Ecolabel."



Questions

1. What are the essential elements of detergents?

- **Correct answer:** The essential elements include surfactants, bleach, fillers, foaming agents, stabilizers, constituents, fragrances, anti-dirt agents, enzymes and other compounds.
- **Incorrect answer:** Essential elements include surfactants, perfumes, bleach, foaming agents, sodium chloride and other compounds.
- **Incorrect Answer:** Essential elements of detergents include surfactants, solvents, thickening agents and preservatives, as it is these ingredients that determine the cleaning ability and durability of the detergent.
- **Incorrect Answer:** The essential elements of detergents include surfactants, emulsifiers, chelating agents and abrasives, as it is these ingredients that determine the cleaning ability on different surfaces and under various conditions.

2. What are the consequences of incomplete degradation of surfactants in aquatic environments?

- **Correct answer:** Incomplete degradation of surfactants in aquatic environments can lead to extensive foaming in streams and rivers near dams, damaging ecosystems and hindering the transfer of oxygen from air to water.
- **Incorrect answer:** Incomplete degradation of surfactants in aquatic environments leads to the formation of a viscous gel on the surfaces of aquatic plants, thereby aiding the growth of algae and invasive plants.

- **Incorrect answer:** Incomplete degradation of surfactants in aquatic environments can lead to the formation of a protective barrier for some aquatic organisms, promoting the growth of harmful ecosystems.
- **Incorrect answer:** Incomplete degradation of surfactants in aquatic environments can be poisonous to some animals that feed on aquatic organisms, thereby decreasing biodiversity.

3. What are the causes of detergent-related eutrophication?

- **Correct answer:** Detergent-related eutrophication is mainly caused by the high presence of phosphates in detergents, which increase nutrient levels in the water. This promotes the rapid growth of algae and aquatic plants, reducing oxygen in the water during the decomposition process.
- **Incorrect answer:** Eutrophication caused by detergents is due to the excessive presence of nitrogen in the water, which accelerates algae growth and reduces oxygen in the water.
- **Incorrect Answer:** Detergents contribute to eutrophication due to the accumulation of plastic in water bodies, causing aquatic organisms to die.
- **Incorrect answer:** Eutrophication is a positive side process that produces an increase in nutrients in the water, promoting the rapid growth of algae and other aquatic plants, a phenomenon known as algal blooms.

4. How does eutrophication damage aquatic ecosystems?

- **Correct answer:** Eutrophication damages aquatic ecosystems by reducing oxygen in the water due to the overgrowth of algae and aquatic plants. As these plants die and decompose, they consume oxygen, causing hypoxia.
- **Incorrect Answer:** Eutrophication promotes biological diversity in aquatic ecosystems by increasing the availability of nutrients to organisms.
- **Incorrect Answer:** Eutrophication has no impact on aquatic ecosystems because algae and aquatic plants are a natural part of these ecosystems.
- **Incorrect answer:** Eutrophication can improve water quality in aquatic ecosystems by promoting the growth of beneficial plants and improving habitat for fish.

5. How do industrial laundries contribute to pollution?

- **Correct answer:** Industrial laundries contribute to pollution through the discharge of large amounts of wastewater containing organic and inorganic contaminants, including mineral oils and detergents.
- **Incorrect answer:** Industrial laundries do not contribute to pollution because they follow strict environmental regulations and treat their wastewater before discharging it.
- **Incorrect Answer:** Industrial laundries contribute to pollution through inordinate energy consumption. In fact, they are responsible for 4 percent of total CO₂ emissions.
- **Incorrect Answer:** Industrial laundries contribute to pollution through the discharge of large amounts of wastewater. However, wastewater is properly treated to reduce the possible environmental impact.

6. What are the effects of detergents in soil and how can they affect plant growth and soil quality?

- **Correct answer:** Detergents in soil can affect plant growth and soil quality due to increased salinity and reduced water-holding capacity.
- **Incorrect answer:** Detergents in the soil can impair plant growth and soil quality due to increased potassium. This results in difficulty in nutrient uptake by plants.
- **Incorrect answer:** Detergents in the soil act as natural fertilizers, increasing the supply of sodium and potassium. This promotes the growth of some plants at the expense of others, producing a decrease in biodiversity.
- **Incorrect answer:** Detergents in the soil have no impact on the surrounding environment, as they are quickly absorbed without causing damage to the soil or plants.