

Will Catalysts Save Our Environment?

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ABSTRACT

Catalysts are a hot topic for scientists in green chemistry. Here's how they can save our environment.

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Introduction

If you own a car, then at some point in your life, you'll end up having to go to the mechanic to address any emergent car troubles. You may experience engine troubles, slower acceleration, or smoke coming out of your car's exhaust, only to find out that you have a "bad cat." What do these cute little furballs have to do with cars?

Well, it's not an actual cat, just in case you were worrying about that. The "cat" in question is a catalytic converter – a component in your car's exhaust system that contains catalysts to reduce pollution in the environment.

Catalysts are materials that speed up chemical reactions by facilitating them such that bond breaking and formation processes require less energy to undergo. During their interaction in the reaction, they do not get spent but rather get recycled as long as the reaction continues.

Since the '70s, catalytic converters have been helping reduce NO_x, SO_x, CO_x, and other exhaust waste gases in vehicles and industrial processes throughout the world. This use of catalysts on a major scale ushered in an era of green chemistry where scientists and researchers look for ways to tackle the environmental problems that plague our world. So, will catalysts save our environment?

Electrocatalysis

These days, scientists are actively working on finding solutions to reducing the carbon dioxide in our environment via carbon capture and utilization technology. This technology works to reduce carbon dioxide into a substance that does not contribute to global warming. The main chemical reaction involves reducing carbon dioxide to carbon monoxide, which can then be

Used to make new compounds that serve as raw materials and fuel for our industries..



Figure 1.

Catalysts to save the environment

Electrocatalytic converters seem like a promising option at the moment because heavy metals like gold and copper, when used as catalysts in the electrochemical cells, have shown promising results in generating CO. More importantly, the process itself requires large amounts of input electrical energy to be successful; however, dwindling renewable energy prices can make the process more economical when used as an energy source.

There is a catch, though. Electrocatalysis requires heavy metal catalysts that are non-renewable and less abundant. Additionally,

they pose a risk to the environment as they have the potential to contaminate sources of water if disposed of improperly. But as researchers look into more suitable meta-materials, the technology may soon become feasible.

Photocatalysis

Photocatalysis is a process that requires the use of sunlight as a source of energy to facilitate chemical reactions in the presence of a catalyst. This technology has made strides in wastewater treatment, but recently scientists found that using TiO_2 as a catalyst in photochemical reactions for the treatment of water used in agriculture. It has the added benefit of being nontoxic while reducing agricultural contaminants like pesticides, which, if left untreated, can destroy food chains and reduce biodiversity within an ecosystem.

Though the research is still new, it is yet to be seen if it can be commercialized into a viable form capable of handling copious amounts of irrigation water.