Green Chemistry: Applications of Naturally Occuring Materials to Replace Harmful Chemical Compounds

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Abstract:

Chemistry is the branch of science which offers numerous opportunities to synthesize products that plays pivotal role in human life. Green Chemistry is the utilization of the materials that reduces or eliminates the use of harmful substances in design, manufacture and applications of Chemical Compounds. It is better to use the compounds from natural sources in order to replace the harmful chemical compounds. A review of applications of naturally occurring compounds used to prepare new materials or compounds helps to reduce risk and harm to normal healthy human life. For example Sugarcane and Cellulose has wide applications in the preparation of biodegradable and renewable materials in replacement of hazardous chemicals.

Introduction:

Chemistry is the branch of science which offers numerous opportunities to synthesize products that plays pivotal role in human life. Chemistry shows us how the world works. It helps us for the synthesis of new compounds, new drugs, increase food production, find new energy sources and discover materials with various properties. Chemistry helps to solve many of humanity's challenges, but at the same time leads to environmental problems. Many of these problems occur because of some harmful chemicals used as a raw material. For example Crude petroleum products right from their origin and other chemicals during their production produces harmful effects on the climate and the surroundings. Thus, due to these reasons the world is almost at dangerous side leading to its end by the use of harmful chemicals.

Green Chemistry is the new field which is going to prove itself as an powerful technique to minimize the effects of the hazardous chemicals. Green Chemistry is the utilization of the materials that reduces or eliminates the use of harmful substances in design, manufacture and applications of Chemical Compounds. It is better to use the compounds from natural sources in order to replace the harmful chemical compounds. Natural sources contain many biologically active molecules which helps to reduce the use of chemicals and with various characteristics also acts as active catalysts. One of the characteristics of biological molecules is a highly functionalized structure which is the result of nature investing energy into the formation of biomass constituents. Not only are these components highly functionalized, some structures have a high degree of complexity which is difficult to match through synthetic production processes. Additionally, many of these complex molecules exhibit health promoting

characteristics. Plants, for example, incorporate bio-active molecules in their skin as a natural barrier to protect themselves against harmful effects from the environment. These secondary plant metabolites comprise a vast diversity of chemical classes and can improve human and animal health. Properties of the latter include anti-oxidant, anti-microbial, UV-protective (used in foods, supplements and cosmetics) and anti-cancer compounds (used in medicinal drugs). Despite these beneficial properties, the skin of fruit and vegeTables is often discharged as waste. These wastes are biodegradable and cause no harmful effect.

The present article shows some applications of such types of biomolecules which can replace or reduce the use of chemicals which have proven to be fatal to the living organisms.

Cellulose Chemistry:

A paper industry uses several tones of chemicals each year to produce and bring about the specialized characteristics of cellulose. Through a chemical process known as esterification – a chemical reaction between an acid and alcohol – various chemicals are bound to cellulose molecules. The result is modified cellulose with desirable technical characteristics. A problem with traditional paper-making processes, however, is that organic solvents and acids are needed to achieve the chemical reactions. Extensive use of chemicals gives rise to a variety of environmental problems and significant quantities of waste.Method for the modification of cellulose-based materials can be developed. The technology is more environment friendly than traditional methods, while also causing significant reductions in material consumption in the paper industry. The technology can be also used to prepare water-resistant paper and textile materials.

Cellulose fiber-OH + R-COOH ⟶ R- COO-Cellulose fiber

Nanotechnology offers many great opportunities to entire world. In the nano world, the proportions are a millionth of a millimeter to a thousandth of a millimeter. The aim of nanotechnology is to study and manipulate matter on a molecular scale. There are many practical applications of nanotechnology, such as electronics, coatings and cosmetics. With nanotechnology, cellulose material can be durable, lightweight, environmentally friendly and cheap. Such high-performance materials can be used in advanced electronics like cars, aircrafts and medical products. The technique is based on wood fibers broken down into their smallest components and then reassembled into new materials.

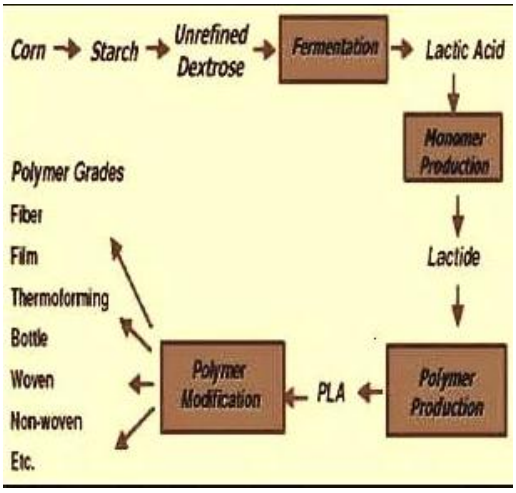
Lactic acid:

Lactic acid, though not much work has been done on it. It can be an essential part of green chemistry. Many of the polymeric properties are hidden in lactic acid. A typical pathway for the preparation green chemicals with the use of ploy lactic acid can be show as follows.

Aspartic Acid:

Polyaspartate is a biopolymer synthesized from L-aspartic acid, a natural amino acid. Polyaspartate has similar properties to the polyacrylates and so it can be used as a dispersant, or an antiscalant, or a superabsorber. But as Poly Acrylic acid is non biodegradable, it creates waste products

and the only way to remove it is to precipitate in the form of sludge. Polyaspartate is biodegradeable, hence it can be used as an option to poly acrylic acid.



Polyethene:

Conventional plastics made from polyethylene can also be more environmentally adapted. Derived from ethylene, the most-produced organic molecule in the world and an important industrial raw material, polyethylene is used in the synthesis of many chemical products. Ethylene is conventionally produced through chemical reactions that utilize oil as a raw material, but "greener" alternatives are emerging, for example starting with ethanol and removing a hydrogen molecule through a process known as dehydration. Green polythene can be produced and it can lead to a pollution free environment throughout the world.

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