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Waste Derived Carbon Nanomaterials. Volume 2

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Chapter 13

Applications of Solid Waste-Derived Carbon Nanomaterials in Anti-corrosion

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The most significant challenges affecting industrial growth are metal corrosion, which not only poses a serious risk to the dependability and safety of metallic structures and machinery but also significantly exacerbates the problems associated with ecological contamination and monetary harm. Moreover, corrosion inhibition techniques are thought to serve as the preferred method for effectively reducing the rate of corrosion in metal because of their great versatility, ease of use, and cost-effectiveness. Still, obtaining eco-friendly inhibitors using affordable, sustainable, and recyclable resources remains challenging. Thus, it has become necessary to carefully design an easy and sustainable approach for creating unique and effective greener rust inhibitors. The global population is growing, industries are expanding, and urbanization has all led to massive production of waste. Nanoparticles derived from diverse waste streams offer a novel approach to avert detrimental ecological effects and implement cyclic financial concepts, which are crucial for attaining resilience. To improve the treatment of solid waste, the most responsible strategy is to transform materials from solid waste to beneficial carbon-based nanomaterials (CNMs) that include CNT, the material graphene, as well as quantum dots made of carbon (CQDs). These CNMs can then be used as predecessors in corrosion inhibition studies. This article provides an overview of the latest developments in the structure and properties and current research of CNMs derived from general waste products.

1. Introduction

Over nine hundred million individuals are predicted to reside in towns by midcentury due to the growing populatison that accompanies urbanization. By that time, sewage contamination is going to be an undesirable consequence of a sharp rise in household and commercial effluent. In poor nations, over ninety percent of wastewater is released untreated, leading to eutrophication—the buildup of dissolved and toxic materials—in rivers, lakes, oceans, and land (*1*). These pollutants contribute to

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the unregulated outflow of commercial and municipal wastewater, which is incredibly harmful to both humans and environmental species. Combustion of organic matter and crop residue produces a large number of pollutants which normally escape to the surrounding environment. The sort and range of organic, non-fossil materials are the primary determinants of pollutant kind. Many harmful substances are frequently emitted into the natural environment, including various gases. In addition to beginning blazes in forests, biomass from trash may increase the release of greenhouse gases globally by twenty-five to thirty percent annually. In general, discarded plastic makes for one-tenth of the world's annual garbage production (2). The production and consumption of polyethylene trash in a variety of sectors, including wrapping, construction and housing, transport, automobile batteries, and gadgets, has caused a sharp rise in global pollution during the past fifty years.

Waste materials from households or cities are often produced by a variety of sources occurring in various locations Figure 1. Based on multiple studies, families account for 55-80% of the municipal solid waste produced in developing nations, with markets and business sectors accounting for the remaining 10-15% (3). The latter is made up of varying amounts produced by sidewalks, organization, business sectors, and numerous additional sources. According to the present waste generation changes, Asian countries are projected to contribute thirty percent of the world's total trash, with an annual creation of approximately more than 27 billion tonnes by 2050 Fig. 2. Approximately 7 lakh tons of trash that is solid is produced daily in Asia; China produces nearly half a kg while India produces 0.7 kg of trash per person daily (4). According to various estimates, by the year 2025, the amount of trash produced in Asia will be expected to increase to 1.8 million tons per day. Plastic trash, ranking as the 3rd most prevalent waste on our planet trailing food and organic waste (5), has currently evolved into one of the most significant global issues related to community wellness and the surroundings Figure 2.

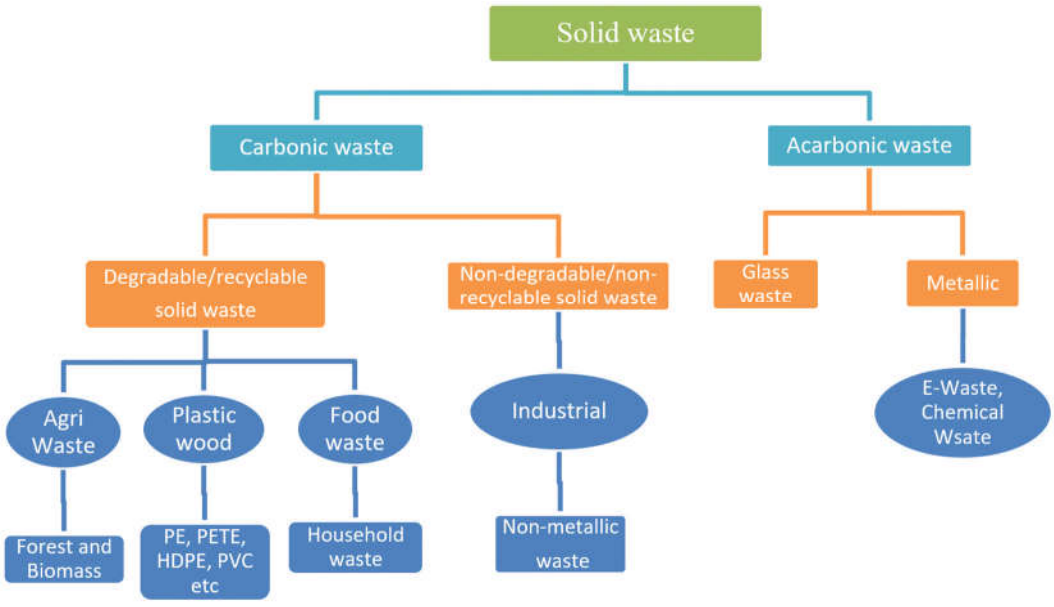

Figure 1. Diagrammatic representation of the different solid waste sources.