

Utilization of Agro-Waste Materials as Viable Strengthening Agents in Carburisation: Review

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Abstract:

Wastes are unwanted by-products of a production process. Waste materials can be recycled and cannot be recycled that are left over after producing or developing significant products manufactured by humans. The rapid industrial revolution and urbanization have brought about a rise in the human population, which led to a massive volume of waste generation. It's interesting to note that practically all agricultural activities produce huge waste, in many nations. Agriculture generates a lot of waste that is typically unused and poses a danger to food security and global health. However, treating these wastes could cause significant financial loss and pose a substantial risk to human health through environmental pollution. Organic wastes can be converted into gaseous, liquid, or solid products through chemical, mechanical, or biological processes which can further be used in industries including chemical, agricultural, food processing, and pharmaceuticals for the development of novel goods for mankind. The drive to undertake this study was inspired by the necessity of turning waste into wealth. This overview describes several agricultural waste products and the various industrial uses for them, including coconut and palm kernel shells, sawdust, charcoal, animal bones, and eggshells. This article also covered the state of agro-residue development based on several value-added uses (carburise low-content steel materials, remove heavy metal and dye, etc.), lowering production and characterisation costs. This article also discusses potential future developments of more effective and efficient bioconversion technology for transforming agricultural waste into high-value products.

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I. Introduction

Globally, solid waste takes the largest part of waste spawned as a result of fast expansion and industrialization. All solid wastes are the materials that are dumped after being used in commercial, industrial, or agricultural processes [1] [2]. Materials that are not first-rate or prime are referred to as wastes. They are substances, by-products, or objects that should be intentionally thrown away. Wastes are created by the originating users for later use in production, transformation, or conversion to serve another function [3]. Recycling- and non-recycling-friendly materials that are left over after manufacturing or creating major products made by human activities are referred to as waste materials. India produces 62 million tonnes of waste annually, with an average yearly growth rate of 4%, according to the Press Information Bureau (mixed waste, which includes both recyclable and nonrecyclable waste) [4]. There are varieties of waste, that originate from many different places. Through on-field or off-field activities, the agriculture industry also makes a significant contribution. The inappropriate disposal of agro-waste such as burning and dumping in undesignated areas is due to improper management and utilization of most agro-industrial waste [5]. The production and characterization of organic wastes and case-hardened composite materials have engrossed a lot of interest globally, as a result of their better formability, user-friendliness, renewable, low cost, the increasing global fight on ecological safety, and stiffer worldwide sanctions for non-compliance [6]. Nigeria is endowed with a lot of mineral and agro-based resources whose exploitation leaves us with huge solid wastes including coconut shell, eggshell, periwinkle, corn cob, charcoal, rice husk, sawdust, and palm kernel shell that could be used in the development of environmental-friendly composite materials such as Eco-pad used in modern vehicle braking systems [7]. Wastes are controlled and lessened environmental pollution when they are used as a replacement for conventional materials [8] The mechanical properties of composite materials are enhanced with the addition of particulates from industrial and agricultural waste [9]. Currently, broad consideration has been given to the design of new methods to avoid the creation or management of toxins materials due to the severe environmental regulations [10]. However, organic wastes like rice straws, coconut shells, fruit and vegetable peels, and many others are a possible alternative to the traditional treatment of metallic materials, according to preliminary findings. These agro-waste compounds have peculiar chemical properties, high selectivity, renewable nature, odd structure, and strong affinity features. Table 1 depicts the wastes produced by agricultural activities, and Table 2 presents the chemical makeup of several agro wastes.

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