

DEVELOPMENT AND CHARACTERIZATION OF CHARCOAL BRIQUETTES FROM SHEA BUTTER SEED SHELL

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ABSTRACT

Conversion of shea butter shell charcoal to briquettes solid fuel is a means to reduce environmental pollution. This study investigated the potential of converting shea butter shell char to briquettes with cassava starch solution. The shell was pretreated and carbonized at temperature of 450°C for 45 min in a furnace. Five briquette samples were produced with constant weight mass of char and different masses of cassava starch binder was varied as 10 %, 30 %, 50 %, 70 % and 90 %. The briquettes produced were analyzed for moisture content, bulk density, shatter index, water resistance, calorific value and compressive strength. The effect of the different binder contents on quality of the briquette samples was also investigated. The result revealed moisture content varied from 9.12 % to 14.83 % and density varied from 0.61 g cm⁻³ to 0.85 g cm⁻³. The water resistance of the briquettes increased from 40.7 % to 75.5 % and shatter index increased from 71.7 % to 92.1 %, while compressive strength values ranged from 18.63 MPa to 24.46 MPa. The calorific values of the briquettes in their increasing amount of binder were found to be between 16.94 and 22.33 MJ/kg. The briquette with the highest amount of binder had compressive strength of 24.46 MPa and calorific value of 22.33 MJ/kg. The results showed the conversion of sheabutter shell to briquette can serve as an effective technique to bringing value and use to biomass wastes.

Keywords: calorific value, shatter index, briquette, SEM, shea butter shell.

INTRODUCTION

The technology of smokeless fuel is a good technique for energy renewal. It is a form of recycling agricultural waste into a useful source of energy [1]. Study shows that large quantity of forest and agricultural residues are generated but are not utilized optimally to add value especially in developing countries. Nigeria and some developing nations generate large number of agricultural by products such as wheat straws, cotton stalk, shea-butter seed shell, rice husk, corn cob or stalk, coal, jute sticks, groundnut shell, and lots more are produced every day. However, they are not maximized adequately to create further use but are dump as wastes. The conversion efficiency of this biomass into further relevance is less than 40 %, they are under exploited [2].

In Nigeria, over 30 million tons of solid waste is generated per year and only about 25 % of the generated

wastes are recycled for human use. Biomass has been the earliest source of energy especially for rural settlers and they are also renewable source of energy [3]. Briquetting is an effective technique to bringing value and use to those biomass wastes. A briquette is a lump of flammable matter obtained from biomass or agricultural residues used as solid fuel for source of heat energy for household and industrial use [4]. Briquettes are also referred to as smokeless fuel. They can be obtained when raw biomass undergo carbonization in a furnace in order for thermochemical conversion to occur [5].

Biomass is abundant and dependable source of green energy which is used in small scale boilers in municipal heating. Biomasses are used to generate heat and electricity thereby minimizing carbon dioxide emission [6]. The term biomass refers to substances that have biological origin which is usually obtained from wastes, plants, residues and forestry products.