IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, December 2024

Utilization of Recycled Low-Density Polyethylene and Carbonized Neem Seed As A Filler in Production of House-Hold Plastic Utensil

Mustapha Basiru[1], Saidu Akun Abdallah[2] and Haruna Abubakar Danyaya[3]
Department of Science Laboratory Technology[1,2,3]
School of Science and Technology, Hussaini Adamu Federal Polytechnic Kazaure, Jigawa State, Nigeria
*Correspondence Email: abubakarharuna34y@gmail.com
ORCID ID: 0009-0006-3325-5597

Abstract: *Using natural fillers reduces the cost of production in plastic recycling. In this work, carbonized neem seed was used as filler to improve the properties of recycled low-density polyethylene. Physical and Mechanical tests conducted on the household plastic utensil produced, showed that, highest bulk density of 0.8±0.1g/cm^3 was found in 100% RLDPE, followed by 0.8±0.1 and 0.8±0.2 g/cm^3 in sample D and E with CNS content of 30g and 40g respectively. The water absorption revealed that, the quantity of water absorbed in the material increased with the increase in content of CNS. Carbonized Neem Seed absorbs water slowly due to its hydrophobic nature. The household plastic utensil with more content of CNS depicted more water absorption capacity. Considerable change in thermal properties of the household plastic utensil was also observed with the addition of CNS with the thermally stability in the order of 133±0.2, 133±0.1, 135±0.2, 140±0.3 and 137±0.2 ^{O}C respectively. The tensile strength and impact strength, also increased with the content of CNS in the household plastic utensil. The impact strength decreased as compared to that of the standard 100 %RLDPE materials used in the current study. FTIR spectrum of the activated carbon revealed the presences of O-H, C=O, P-C, and N-H, functionalities indicating the presence of alcohol, ketones, amides, organophosphorus compounds, and nitro groups. SEM images showed typical carbon morphology, retaining the original seed's structure. The carbonization process created pits with different sizes, forming micropores, mesopores, and macropores in activated carbons. SEM images of 100% RLDPE and five RLDPE-carbonized neem seed-household plastic utensil showed absence of spherulitic structure due to limited nucleation sites Filling RLDPE with more filler created more spherulites, which are linked to the crystallization of polymers from the melt and are characterized by increased density and hardness.*

Keywords: Organic waste: Plastic waste, Carbonized neem seed filler, FTIR characterization, scanning electron microscopy RLDPE-CNS.