

Utilization of Recycled Egg Carton Pulp for Nitrocellulose as an Accelerant in Briquette Production

ABSTRACT

Nitrocellulose (NC) is a conservative material that is used in a variety of applications, such as coating agents, biodegradable plastics, and propellant main charge. Nitrocellulose raw materials are easily obtained from lignocellulose sources, most notably cotton and wood pulp. The egg carton, a recycled paper waste designed for packaging and transporting eggs, is used in this study to make nitrocellulose in pulp form. The effects of different nitration durations (40, 50, and 60 min) from egg carton pulp bleached with various KOH concentrations (0.6 M, 1.0 M, and 1.5 M) on NC properties were evaluated. The accelerant properties of the NC of nitration time in 50 min were studied in a rice husk charcoal briquette. Rice husk charcoal briquettes are made in various ratios with nitrocellulose as an accelerant (97:3, 96:4, and 95:5). The NC was characterized using Fourier transform infrared (IR) spectroscopy and thermogravimetric (TG) analysis. 1.0 M of bleached egg carton pulp has the highest cellulose content (86.94%) with the presence of crystalline structure of cellulose at peak 1430 cm^{-1} after the bleaching process. Meanwhile, different nitration times revealed that 50 min had the highest nitrogen content (7.97%) with a 1.23 degree of substitution (DS) value. Based on its TG analysis, NC 50 has met the requirements for use as an accelerant for briquettes, with an onset temperature of $91.60\text{ }^{\circ}\text{C}$ and a weight loss of 62.60%. Infrared at peak 1640 cm^{-1} confirmed the presence of NO_2 groups in nitrocellulose successfully formed by nitration. After the addition of nitrocellulose, the calorific value of the briquette increased from 13.54% to 15.47%. Fixed carbon and volatile matter showed the same pattern. The combustion of nitrocellulose-briquette has also been demonstrated by Td10% of degradation, which degraded between 310 and $345\text{ }^{\circ}\text{C}$.