Thermo-Gravimetric Investigation of Biofuel Mix Performance for Renewable Energy Generation

T. Qureshi[1], M. Farooq[1,*], A. Nizami[2], F. Riaz[3], U. Ali[1], M.H. Siddiqi[4]

[1]Department of Mechanical Engineering, University of Engineering and Technology, Lahore, Pakistan
[2]Sustainable Development Study Centre (SDSC), Government College University, Lahore 54000, Pakistan
[3]College of Engineering, Abu Dhabi University, Abu Dhabi, UAE
[4]School of Energy and Power Engineering, Xian Jiaotong University, Xian, China
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Presenting author email: engrfarooq137@gmail.com

Introduction

The lack of renewable energy and environmental degradation are one of the most pressing problems confronting our global community. Yet, Pakistan's condition is worse because of its substantial reliance on non-renewable energy sources, as well as the constraints and difficulties associated with maintaining a clean atmosphere (Siddiki et al., 2022). Pakistan's energy mix is reliant in major part on imported conventional fuel. In addition to harming the environment, imported petroleum also increases the risk of geopolitical unrest. Additionally, Pakistan's solid waste is growing significantly every day as a result of poor waste management strategies (Yogalakshmi et al., 2022) .In order to create sustainable environmental practices, it is necessary to adopt an integrated approach for the production of fuel that depends on local energy sources and waste-to-energy strategies (Chen et al., 2022The utilization of locally sourced lignite as a means of generating clean energy is becoming an increasingly crucial factor in domestic industry. Due to its lower carbon content and higher volatile and sulfur contents, lignite is classified as the lowest rank of coal (Gumisiriza et al., 2017). Given this context, it is important to investigate the thermal behavior of blends of lignite and cotton stalks during pyrolysis, in order to determine their potential as a sustainable, clean substitute for traditional energy resources. (Siddiqi et al., 2020).

Materials and Method

Figure.1 represents the production of biomass-coal blend. Initially raw biomass will be shredded and then sieved for the formation of sample. Biomass sample will be washed using distill water for the removal of impurities and dust Particles. The washed sample will then demineralized for the purpose of treatment following this sample will be neutralized. This neutralized sample will be utilized for making blend with using different ratios.

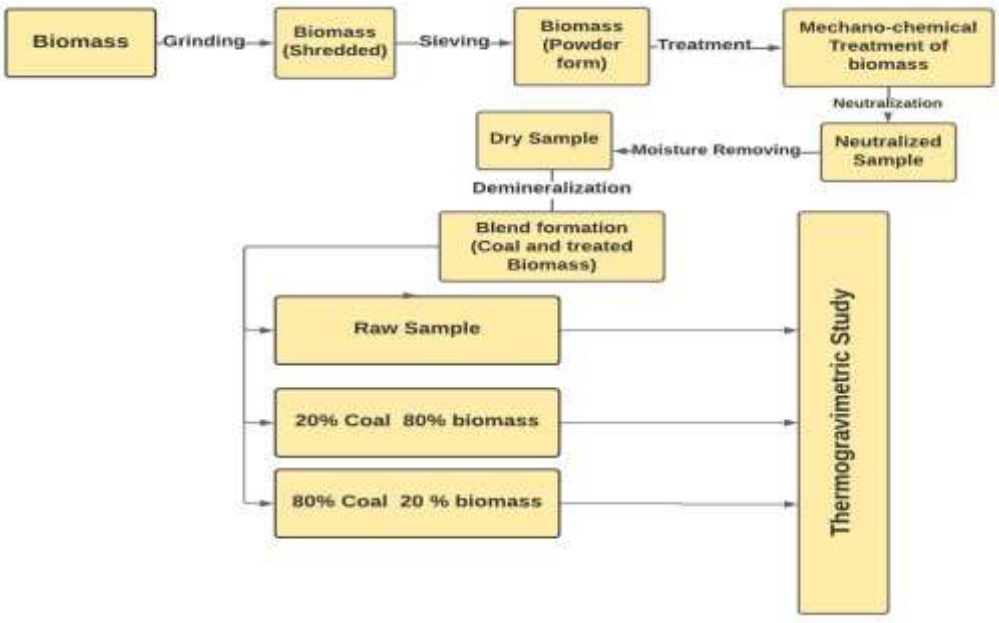

Figure 1: Experimental methodology for TG investigation biofuel mixed coal

Results and Discussion

Figure.2 compare the TGA curves for the different blends of biomass mixed with coal. It can be witnessed that degradation of the samples has prominent variation due to blending. Figure.2a exhibits highest fixed carbon region due to the presence of coal while in figure.2c least range of fixed carbon zone. However volatility affect is maximum in the raw biomass sample. Figure.2b.(Biomass: 80%, Coal:20%) represents the sample in which fixed carbon range and volatile range is quite moderate, environmental friendly in nature and is suitable for waste to energy application.

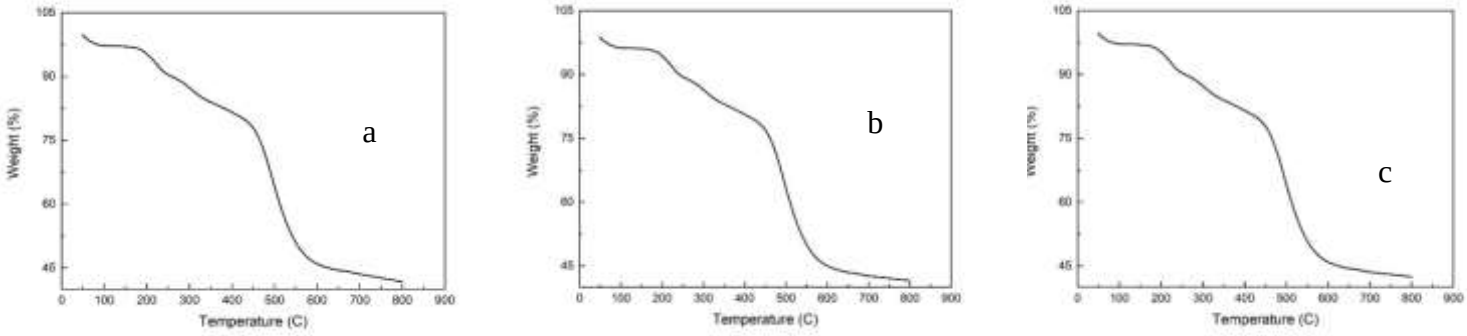

Figure.2: TGA profiles of Biomass blends with Coal (a).Coal: Biomass 80:20; (b).Coal: Biomass 20:80; (c).Raw case)

Conclusion

From the current study it can be concluded that neither biomass nor coal can be used single-handedly. An optimal blend of coal and biomass is the vital solution with perspective of clean energy. Thermogravimetric results has also validated the blend formation for cleaner production of energy.

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