Waste to Renewable Energy: Biogas Clean-up in Tanzania and Kenya

Cecil King'ondu / Nelson Mandela African Institution of Science and Technology

H_2S Scrubbing Filter being Connected to Biodigester via Mass-flow controller.

MSc student sponsored by the project.

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Research Approach: Development of a tandem oxidative-adsorptive process to remove both the H_2S and more refractory organic sulfur compounds from biogas at room temperature.

The following kinds of data were collected:

- The amount of sulfur in biogas produced from different substrates.
- Crystal structure, morphology, particle size, surface area and porosity of both manganese oxide and water hyacinth derived carbon materials.
- Catalytic and adsorptive performance of manganese oxide and water hyacinth derived carbon materials, respectively.
- The influence of adsorbent and catalyst mass loading, biogas flow rate, carbon-to-activating agent ratio, water moisture, and the order in the tandem connection (oxidative-adsorptive or adsorptive –oxidative) on the sulfur removal efficiency.

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A cheap filter effective in removing not only hydrogen sulfide but also ammonia from biogas was developed - hydrogen sulfide but also ammonia lead to SO_x and NO_x upon combustion – these compounds are harmful to both environment and public health.

Catalytic-adsorptive arrangement of the sulfur scrubbing units was found to be more effective than adsorptive-catalytic.

Biogas produced from cow dung substrate was found to contain the lowest amount of hydrogen sulfide and ammonia compared to waste from winery industry and kitchen.

Water moisture was found to significantly reduce the performance of the developed filter.

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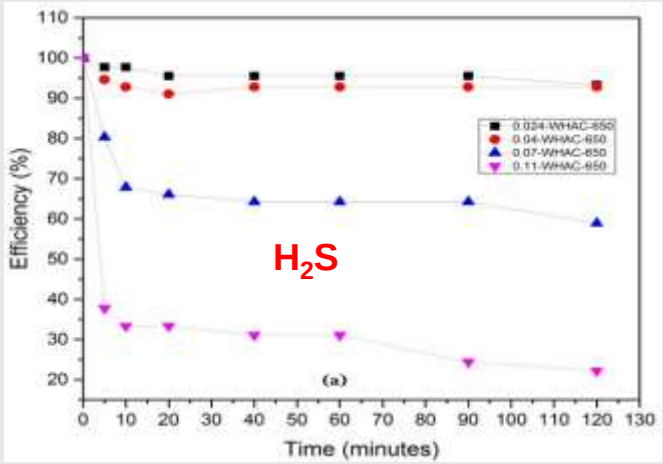
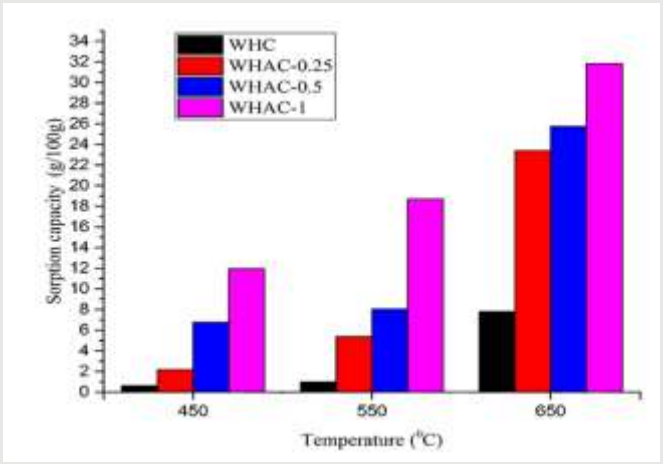
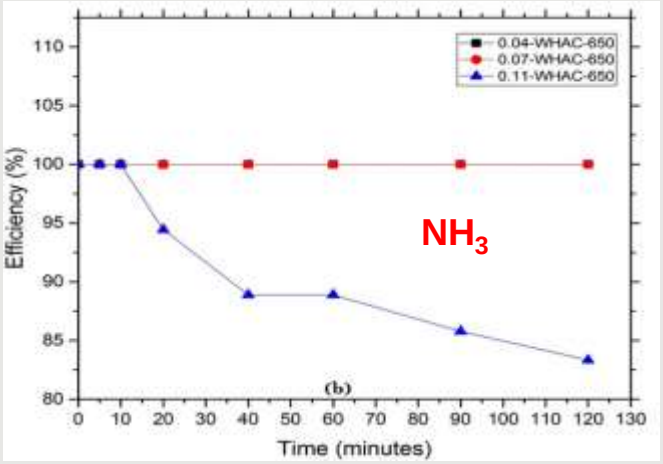
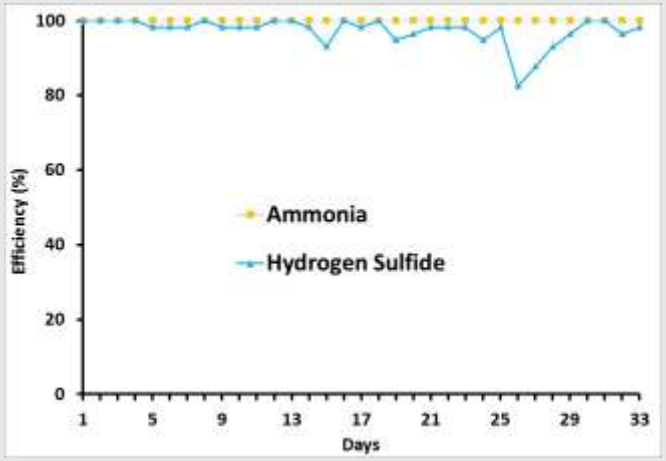






Effect of flow rate



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Top next steps for your project:

1. Develop moisture scrubber to lengthen the life-time of the sulfur and ammonia filters developed.
2. Launch a campaign on the effect sulfur and nitrogen in biogas on health and environment and market the filters we developed.

How data and results from your project will impact stakeholder decisions and the development problem:

1. Spur the use of biogas in learning institutions, hospitals, farms, households and even in power generation plants.
2. Encourage policy makers in coming up with maximum allowable limits for sulfur and nitrogen related compounds in biogas.

Challenges you have faced in collecting meaningful data:

1. Delays in procurement and unreasonably high prices from local suppliers.
2. Work and residence permit delays.

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