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Our Ref: BD. 320/452/01/54 **Date:** 13th April 2021

TO: The Public

REF: ANNOUNCEMENT OF VIVA VOCE EXAMINATION OF A PhD CANDIDATE, MR. ERIC MUTEGOA (REG. NO.: P242/T17)

Please, refer to the heading above,

Dean of the School of Materials Energy Water and Environmental Science (MEWES) at the Nelson Mandela African Institution of Science and Technology (NM-AIST), wishes to announce the VIVA-VOCE Examination of **Mr. Eric Mutegoa,** a PhD candidate in **Materials Science Engineering**, specialized in **Energy.**

The VIVA VOCE examination is scheduled on:

Friday, 30th April 2021 in Room L 2 from 11:00 am to 2:00 pm

Research Title: "Controlling Ammonia and Sulfide Inhibition during Anaerobic Digestion of Slaughterhouse Waste"

Abstract:

The performance of experimental batch-reactor loaded with slaughterhouse waste at mesophilic temperature was investigated as well as the inhibition of both ammonia and sulfide concentration in the aqueous phase during phase I of anaerobic digestion. The digester was operated for 68 days by evaluating the process stability basing on controlling parameters such as pH, volatile fatty acids and alkalinity in relation to the methane (CH_4) produced. The maximum CH_4 content of 69.6% was achieved at 0.37 VFA/Alkalinity ratio and pH of 7.51 during day 37 of anaerobic digestion. However, a sudden increase of ammonia nitrogen in the digester from day 44 to day 68 decreased the methane content about 62.15% from 65% to 24.6%. During this time, it was observed that the ratio of VFA/Alkalinity decreased to 0.16, in which the VFA concentration decreased to 150.92 mg/L as a result of methanogens consumption. Meanwhile, the evaluation of the level of both ammonia and sulfide in the aqueous phase revealed that the inhibitory effect of ammonia

concentration was higher than sulfide concentration at the maintained pH level above 7. However, during phase II of anaerobic digestion, the efficacy of inorganic additives on the removal of total ammonia nitrogen (TAN) and sulfide in the aqueous phase of slaughterhouse waste undergoing anaerobic digestion in the batch reactor was investigated for 65 days. A mixture of natural inorganic additives processed from the anthill and red rock soil samples collected from Arusha, Tanzania was used as adsorbents in different ratios. Prior to analysis, the materials were pulverized, calcined at 700 and 900 °C for 2 hrs in a furnace and then sieved to 250 µm fine particle size. The XRD analysis revealed that the anthill soil sample is endowed with quartz and hematite major mineral phases while red rock soil contains albite, pyroxene, and quartz as predominant phases. The anthill and red rock soil samples calcined at 900 °C displayed higher BET surface areas of 815. 35 and 852.35 m 2 /g, respectively. The mixture of anthill soil and red rock soil in a ratio of 3:1 had higher TAN removal efficiency of 92% at a contact time of 30 minutes compared to other ratios. On the other hand, the ratio of 1:2 showed higher sulfide removal efficiency of 79% at a contact time of 60 minutes. Adsorption isotherm studies revealed that Jovanovich model fitted better to the experimental data than Langmuir and Freundlich models. Our findings have demonstrated that anthill and red rock soils can be exploited as affordable, ecofriendly and efficient adsorbents for mitigation of TAN and sulfide from the liquid phase and sustenance of methanogenesis.

You are all welcome

Prof. Revocatus Machunda
Dean - MEWES