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EFFECT OF NANO-SCALED METAL OXIDES ON THE CARBON-NITROGEN RATIO OF COW DUNG FOR SUSTAINABLE BIOGAS PRODUCTION

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Over the past decade, South Africa has experienced massive scheduled power outages due to the inadequate generation capacity of coal-fired power plants. This ongoing crisis is likely to continue if researchers do not look for alternative methods to solve South Africa's poor energy supply. One alternative solution that could prevent South Africa from this crisis is using clean energy such as solar, wind, biomass, etc. Studies have shown that methane produced by anaerobic digestion offers enormous potential as a renewable energy source. Anaerobic digestion (AD) technology is one of the most popular renewable energy technologies. During AD, bacteria break down organic matter - such as animal manure, solid wastewater, and food waste -into biogas without oxygen. Biogas consists primarily of methane (CH4) and carbon dioxide (CO2), with minimal water vapour and other gases. Although AD technology is widely used, its low biodegradability and biogas production limits its commercial application. Hence, the use of nanoparticles (NPs) as additives has been extensively investigated and shown to significantly improve AD performance and biogas production. The NPs mostly used as additives in the AD process are zero-valent metallic NPs, metal oxide NPs, carbon-based nanomaterials, and multi-compound NPs. However, recent studies have found that metal oxide NPs are more suitable for enhancing biogas and CH4 production. This study, therefore, investigates the effect of metal oxide nanoparticles on anaerobic digestion with the aim of experimenting using local organic materials for biogas production. The potential nano-additives to be explored are calcium oxide (CaO), iron oxide (Fe2O3/Fe3O4), potassium oxide (K2O), magnesium oxide (MgO), manganese oxide (MnO2), and phosphorus pentoxide (P2O5), and titanium oxide (TiO2).

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Yes

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PhD

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