Announcing the Final Examination of Ikenna Ezeodurukwe for the degree of Master of Science

Time & Location: March 26, 2018 at 10:30 AM in Engineering 2 conference room 211P
Title: Harmful algal bloom (HAB) Mitigation using Recycled Concrete Aggregate Coated with Fixed-Quat.

Human activities generate surplus nutrients which may lead to algal bloom events in water resources along with serious ecological problems and thus substantial economic losses. Particularly, harmful algal blooms (HABs) represent toxic cyanobacterial blooms which produce cyanotoxins. The primary concerns of HABs are the exposures to a wide variety of cyanotoxins via ingestion of contaminated drinking water, inhalation during recreational activities, and consumption of contaminated fish and shellfish. However, conventional physical and chemical methods are not always possible to efficiently handle these HABs events. It is urgent to develop viable and rapid solutions to control HABs and mitigate the effects of HABs in fresh water, particularly in those that serve as sources of drinking water supply.

Quaternary ammonium compounds are organic antimicrobial compounds that are attractive alternatives to available chemical-based technique due to its less toxicity and its affinity for variety of surface. Herein, recycled concrete aggregate (RCA) from construction and demolition (C&D) waste recycling facility was used as a sustainable and environmentally friendly disinfecting substrate and coated with a composite of silica-quaternary ammonium compounds (Fixed-Quat) for HABs mitigation.

The algistatic capabilities of imparting antimicrobial properties of Quats to the RCA surface, which involve the covalent attachment of the biocides to the surfaces, were investigated on HABs causing algal species, Microcystis aeruginosa. Chlorophyll-a was estimated to determine the changes in the efficiency of photosynthesis in each sampling time. OD660 and pH were measured as key parameters measured to investigate cell growth and to monitor hydration from cement. Notably, a 66% reduction of total chlorophyll-a within 6 hours and complete removal of chlorophyll-a within 8 hours showed that Fixed-Quat coated RCA could be efficient in growth inhibition of harmful algae specie Microcystis aeruginosa. Overall, the antimicrobial coated RCA promises a sustainable alternative to conventional HABs mitigation in various aquatic systems.

Major: Environmental Engineering

Educational Career:
Bachelor’s of Environmental Technology, BS, 2014, Federal University of Technology, Owerri Imo State, Nigeria.

Committee in Charge:
Woo Hyoung Lee, Chair, Civil, Environmental, & Construction Engineering
A H M Anwar Sadmani, Civil, Environmental, & Construction Engineering
Andrew Randall, Civil, Environmental, & Construction Engineering

Approved for distribution by Woo Hyoung Lee, Committee Chair, on March 12, 2018.

The public is welcome to attend.