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### Introduction

This issue of Journal of Petroleum and Environmental Technology brings to you a total of ten research articles that cover a variety of relevant petroleum and environmental biotechnology topics.

Three research articles deal with relevant environmental issues pertaining to impact of climate change on crop production, carbon capture and storage, and solid waste management. Two research articles touch on two environmental biotechnology issues namely indoor air quality of biological laboratories and biodegradation of poly-aromatic hydrocarbons (PAHs) by aerobic heterotrophic bacteria.

Two research articles focus on the advancement in petroleum biotechnology techniques for studying the effect of toxic chemicals in the crude oil and its water soluble fraction (WSF) at contaminated sites and biodegradability of polyaromatic hydrocarbons (PAHs) in a crude oil contaminated surface brackish water creek.

Two research articles report on the ongoing efforts to remove organic contaminants and the emulsified oil and wastes from wastewater arising out of petroleum industries. One research article documents the safe practices in drilling and completion of sour gas wells.

### Environmental Issues (Climate Change, Carbon Capture and Storage, and Solid Waste Management)

The study of impacts of climate change on chickpea production highlights the production adaptation strategies for chickpea in response to changing climate. The results suggested that changing CO<sub>2</sub> concentration would not make much difference in crop yields; however, to reduce the negative impacts of climate change, early planting is one of the adaptation options to consider for chickpea production in the study area.

### Carbon capture and storage

The study attempts to document the impacts of applying Carbon capture and storage (CCS) technology on the reduction of air pollution and global warming and also surveys the side effects of this technology in the context of international environmental law.

### Environmental management systems

The article reports on the analyses of environmental impact assessment and environmental management systems for a European municipal waste disposal plant under Environmental impact assessment and environmental management systems. Though, there appear no universal methods for municipal waste disposal and processing and a total elimination of municipal waste, the optimal solution would be a comprehensive, individually designed for each

urban agglomeration, municipal waste disposal system, taking into account regional, socio-economic and environmental conditions.

### Environmental Biotechnology

The study on indoor air quality of biological laboratories in the University of Port Harcourt, Nigeria, found that the sample sites were laden with microorganisms and most of which were pathogenic to human. Adequate Sanitary measures such as disinfecting work benches before and after use by laboratory users and use of vacuum cleaner or wet mop instead of the practice of sweeping the floor with broom can help reduce the level of bio aerosols. These techniques will help reduce the microbial load of the environment instead of pushing bio aerosols off to the air as observed in the case of sweeping practice.

### Biodegradation of poly-aromatic hydrocarbons (PAHs) by aerobic heterotrophic bacteria, cyanobacteria, consortium

The study results show that a significant degradation of petroleum hydrocarbons could be achieved by the cyanobacteria isolates. These findings vary from previous research findings on the capability of resident microbial flora to biodegrade petroleum hydrocarbons and the controversy that generated about the specific roles played by each of aerobic heterotrophic bacteria and cyanobacteria in the consortium during petroleum hydrocarbon degradation.

### Petroleum Biotechnology

The study highlights the use of histology of the kidney as an effective toxicity indicator for pollution studies and indicator while studying the effect of toxic chemicals in the crude oil and its water soluble fraction (WSF) at contaminated sites.

### Aerobic degradation

The study reports on biodegradability of polyaromatic hydrocarbons (PAHs) in a crude oil contaminated surface brackish water creek. The study proved that the resident flora has inherent abilities for PAHs degradation under moderate salt conditions without nutrient amendment, thus providing evidence of the presence of PAHs degrading halo-tolerant bacteria and cyanobacteria under moderate salt conditions.

### Downstream Petroleum Industry

In a comparison study, capabilities of adsorption of 4-chlorophenol on mesoporous and microporous carbons were investigated. This work also describes the preparation of mesoporous carbon and its characterization using SAXRD, SEM, TEM, and nitrogen adsorption techniques. The results show that mesoporous carbon adsorbent is

good candidates for applications in 4-chlorophenol removal from polluted water and wastewater.

### **Electro-coagulation treatment**

In order to remove the emulsified oil and wastes from wastewater arising out of petroleum industries, a treatment by electro-coagulation flotation using Aluminum electrodes was tested. The results were found encouraging. To see the impact of the treated water on vegetation, some irrigation tests have been conducted regarding two types of plants (date palm and shaft apocalyptic) for 13 months. The tests showed that the thick layer and fine particles diameter of dune sand removed most of the remaining oil. The layer that fills the basin surrounding the shaft was removed and replaced every 3 months. So,

fine dune sand played the role of biological filter for oil remained in water after electrocoagulation treatment. The little garden plants appeared and grew normally.

### **Upstream Petroleum Industry**

Dealing with sour fields is a challenge that upstream petroleum industry will face more often and it is a challenge that will keep on increasing in difficulty. The keys to face this challenge are knowledgeable personnel who have received the proper training, proper training to select material and plan operations, proper training to execute a plan safely and react swiftly. There is very little room for error when it comes to drilling and completing gas wells containing significant amounts of hydrogen sulfide.