Remediation technologies for oil contaminated soil

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Abstract (300 word limit)

Statement of the Problem: Crude oil continues to impact many nations as it is among the major sources of fuel. Contamination resulting from its use in industries such as mining, transportation and petroleum especially soil contamination cannot be overlooked. Soil pollution resulting from oil contamination can be seen as being among the twenty-first-century vulnerabilities because if not well taken care of the consequences can be devastating. This review highlights common sources of soil pollution and their effects, oil waste disposal methods, soil remediation techniques that are well established and those still in their infancy. Such techniques include bioremediation such as phytoremediation and landfarming; physical methods such as excavation and incineration; chemical methods such as oxidation; and photocatalysis. The choice of remediation in mining, transportation and petroleum industries depends on the urgency and hazardous effects of the pollutant.

Methodology & Theoretical Orientation: In Zambia, Mopani Copper Mines uses landfarming as a means to mitigate large amounts of soil contaminated with oil wastes, but the process is slow. In the proposed research, photocatalysis coupled with adsorption of oil on clay will be used to assess the effectiveness of this emerging technology to quicken the degradation of oil in soils. Clay will be incorporated with metal ions and with hydrophobic groups to enhance light absorption and oil-clay interaction, respectively.

Findings: The extent of photo-degradation of oil waste will be evaluated using the Soxhlet technique by determining the percent residual oil and carbon content analysis.

Conclusion & Significance: The importance of remediating contaminated soil in any nation cannot be overemphasized as consequences of not remediating this precious resource might be devastating. Since economic development through industrialization will continue, there is need to constantly improve on methods of mitigating the impact of wastes on the environment, especially in developing countries, where engineering of cheap, nontoxic materials for soil remediation is paramount

Image

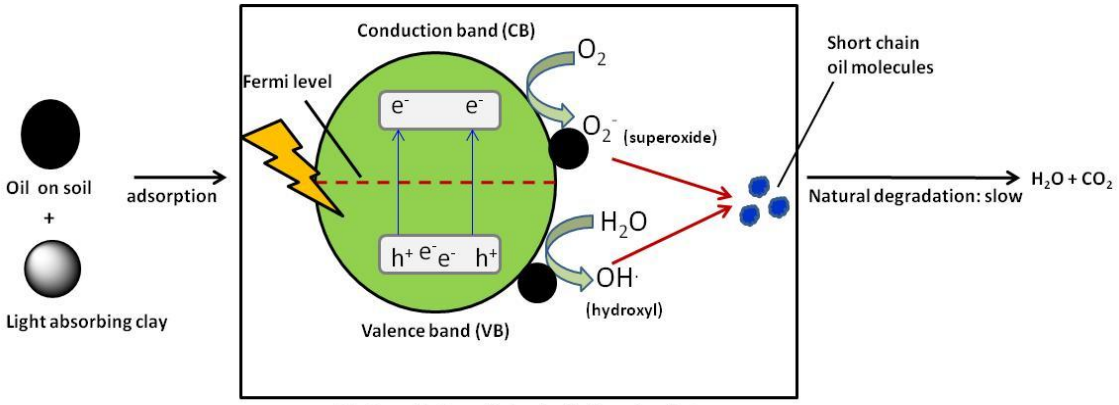


Photo-oxidation of adsorbed oil on clay: fast

Recent Publications (minimum 5)

1. M. Mambwe, **K.K. Kalebaila**, T. Johnson **(2021).** Remediation technologies for oil contaminated soil. *Global Journal of Environmental Science and Management,* 7(3): 1-20.
2. Kalebaila K. Kennedy*, Maseka, Kenneth, and Misheck Mbulo**(2018),**Selected Adsorbents for Removal of Contaminants from Wastewater: Towards Engineering Clay Minerals. *Open Journal of Applied Sciences*, **8**, 355-369. Scientific Research Publisher (SCIRP Open Access)
3. Kalebaila K. Kennedy* and Kamwela M. Zawadi **(2018)**, Towards the Use of Software Modelling for Determination of Heavy Metal Speciation in Soils in Zambia. *Open Access Library Journal, 5,* 1-10.
4. Kalebaila K. Kennedy* and Fairbridge Craig, (**2014),** *UV Photocatalytic Degradation of Commercial Naphthenic Acid using TiO_2-Zeolite Composites*, *J. Water Res. Protec.* 6, 1198-1206.
5. Kalebaila K. Kennedy; Stephanie L. Brock, *Lead Selenide Nanostructured aerogels and Xerogels*, *Z. Anorg.Allg. Chem*. **2012**, 638, 2598-2603.
6. Kalebaila, K. Kennedy; Klabunde J. Kenneth, An Inorganic Oxide TiO_2-SiO_2-Mn Aerogel for Visible-Light Induced Air Purification. *In Nanoscale Materials in Chemistry: Environmental Applications,* ACS Symposium Series: Vol. 1045; (Erickson, L. E., Koodali, R.T., and Richards, R.T.), **2010**, pg 207.
7. Hamal, D. B.; Kalebaila, K.K.; Klabunde, J.K.; Mixed Metal Oxide Nanomaterials for Environmental Applications. In *Nanomaterials for Life Sciences: Vo.* 3; (Kumar, C.S.S.R.**,** Ed.); Wiley-VCH, **2009,** pg 139.



Biography (150 word limit)

Kennedy Kalebaila Kalebaila received his doctorate of philosophy in chemistry (Inorganic Nanomaterials) from Wayne State University - Michigan, US 2007 m, after obtaining his Master of Science in Inorganic Chemistry in 2002 from University of Guelph, Canada. In 2007, he went to Kansas State University for hi postdoctoral research followed by research at National Research Council of Canada-CanmetEnergy as a visiting fellow from 2011 to 2014.

Kennedy is involved in teaching of inorganic chemistry at both undergraduate and graduate levels and his research interests' lies in the application of bulk and nano-inorganic materials to address problems in water, soil and land pollution. Previously, he worked at Kansas State and CanmetEnergy dealing with synthesis of adsorbents for carbon dioxide capture and for UV photocatalytic degradation of naphthenic acids in tailings water using sunlight.

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