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Biogeochemical Cycling of Nutrients and Natural Philosophy

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Review Article

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ABSTRACT

In this an endeavor was made to portray the biogeochemical cycling of carbon, nitrogen and phosphorous in the Earth's framework furthermore to relate their event with the Earth's framework Thermodynamics. These worldwide cycles result in the upkeep of an exceptional thermodynamic condition of the Earth's framework which is a long way from thermodynamic harmony. The exchange of matter and vitality between the Earth's frameworks supplies is contemplated in connection to procedures utilizing sun powered radiation to monitor vitality e.g., photosynthesis. The created concoction vitality is utilized to support life, additionally to give extra free vitality to geochemical responses, subsequently adjusting their rates.

INTRODUCTION

The expression "biogeochemical cycles" is utilized as a part of request to portray the exchange and change of matter and vitality between the biosphere and the other dynamic supplies of Earth the climate, hydrosphere, and lithosphere [1-27]. Amid the working of a biogeochemical cycle, a progression of atomic animal groups which are crucial for supporting life on the planet, likewise alluded to as supplements, are as a rule always transported and artificially changed. The fundamental substance components making up the essential supplements coursing inside a biogeochemical cycle and which are included in the organizing of complex bio-polymers (e.g., proteins, DNA, RNA, and so on.) are C, N, S, P, and O. A biogeochemical cycle is enacted by means of coupling of the biosphere to supplement fluxes supplied by destinations or dynamic focuses on Earth (e.g., volcanoes and aqueous fields). Such locales/focuses go about as a consistent wellspring of matter (e.g., unstable compound species) and/or vitality on the Earth surface, either on a territorial or a worldwide scale, which can be utilized by various living structures [28-52]. The biosphere, being the top level biological community, requires various supplements for its capacity and in this

manner, it has built up a progression of complex collaborations with the distinctive Earth repositories. These collaborations are controlled by both negative and positive input control instruments and constitute the diverse biogeochemical cycles [53-67]. It is in this manner reasoned that the effective capacity of a biogeochemical cycle is unequivocally reliant and obliged by the inflow and outpouring of supplements through basic locales or dynamic focuses of the Earth. Such destinations/dynamic focuses are legitimately considered to serve as indispensable "planetary organs" whose breaking down would prompt breakdown of the biogeochemical cycle. As a self-defensive activity, the biosphere has some of these crucial organs as particular trophic gatherings which are guided via autotrophic living beings that possess territories of the planet and lead to vitality stockpiling by means of the creation of complex biomolecules. Since the support of a biogeochemical cycle relies on upon procedures including vitality stream and capacity, it is derived that it can be depicted by utilizing the standards of thermodynamics [68-72]. Earth frameworks are not disconnected (shut frameworks) since there exist solid communications between the climate, hydrosphere, lithosphere and biosphere. The various thermodynamic procedures which occur can be seen and isolated into those that constantly perform work and make free vitality and those that disperse free vitality and consistently create entropy. Entropy generation is an immediate estimation of the level of irreversibility of a thermodynamic procedure and it is the main thrust for guiding a thermodynamic framework to embrace and be kept up in a state a long way from thermodynamic balance (TE). The likelihood of the Earth, as a thermodynamic framework, to support a state far from TE can be determined while considering the way that Earth may trade entropy with space [73-79]. Along these lines, it appears that non-balance thermodynamics could give an all-encompassing premise to depicting and anticipating the emanant, a long way from TE, thermodynamic condition of the Earth as one framework and additionally of various subsystems, e.g., natural or environmental frameworks [80-87]. Utilizing this viewpoint as a beginning stage, one may consider inspecting the conceivable part of life, existent in the biosphere, in coordinating and keeping up a biogeochemical procedure in a consistent state a long way from TE [88-94].

BIOGEOCHEMICAL CYCLE OF CARBON

Carbon is available in two structures: natural and inorganic. The biochemical and geochemical burning of these structures through the Earth procedures is alluded to as the worldwide carbon cycle. The worldwide carbon cycle is firmly connected to the worldwide cycles of different components, for example, oxygen, nitrogen, and sulfur. Natural carbon (OC) is available in both living and nonliving frameworks giving the essential fuel to the greater part of the Earth's biogeochemical forms [95-101]. Along these lines, understanding the arrangement, cycling and conservation of OC is fundamental for comprehension the cycling of all components which are organically significant, the development of financially exploitable oil (petroleum) and coal stores, and for anticipating the impact of human action on the normal parity of these frameworks.

A significant part of the OC made amid photosynthesis by microorganisms (e.g., cyanobacteria) and higher plants or by chemosynthetic autotrophs is decayed by heterotrophic creatures. Heterotrophic procedures happen in the water segment of marine and sea-going situations, and also in residue, soils, and shakes. A significant part of the deterioration of natural matter (OM) happens under low temperature (<50 °C) and weight amid diagenesis. The cycling of carbon in a worldwide scale because of anthropogenic exercises likewise includes OC fluxes to and from the major OC supplies. Sedimentary rocks constitute the biggest OC save, making up around 99.5% of the aggregate worldwide OC. In any case, OC just speaks to one-fifth of the aggregate sedimentary carbon, since inorganic carbon

is the overwhelming portion [102,103]. Sedimentary OC happens principally as kerogen, coal beds, and petroleum repositories, which are eventually gotten from biogenic procedures or sources. Kerogen is a shapeless, exceedingly insoluble particulate material that is framed by two pathways - to be specific protection and geo-polymerization both of which happen under low temperature and weight conditions. Protection includes the development of kerogen from bio-macromolecules that are impervious to microbial corruption. Geopolymerization happens through an arbitrary arrangement of buildup and polymerization responses which include humic substances. Petroleum is characterized as happening liquid (blend of fluid and broke up gasses) and which is framed fundamentally from the remaining parts of microorganisms (green growth and microscopic organisms), albeit a few sorts of petroleum are shaped from the remaining parts of higher plants. Interestingly, coal is a strong and is framed from the remaining parts of higher plants.

The most widely recognized sort of coal, known as humic coals, is shaped by means of the procedures of peatification and coalification, which include both natural and geochemical forms. The OC nearness in antiquated sedimentary rocks gives these financially critical fossil fills and in addition a sub-atomic record of life, which has permitted to concentrate on the reaction of characteristic frameworks to structural, natural, and organic change. Sedimentary OC influences organically intervened cycles on geologic time scales, although there is proof that these cycles appear to be quickened by people through fossil fuel burning.

The major fluxes between natural pools are driven by marine and physical essential creation. Photosynthesis, the reaping of light vitality and consequent usage to change over inorganic carbon to diminished (natural) frames in the tissue of plants, is the essential method of essential generation. In any case, chemosynthesis by microbial life forms, which utilizes synthetic vitality as opposed to daylight, is likewise vital. Photosynthesis is completed by prokaryotes, for example, cyanobacteria and also eukaryotic green growth and higher plants. The obsession of carbon by plants represents the nearness of atomic oxygen in such high focus in the environment. In this way, the cycles of carbon and oxygen are firmly connected over geologic time.

To keep up current climatic oxygen levels, quick cycling of carbon in the surface pools is required. These pools trade carbon on moderately short timescales (10^{2}-10^{4} years). Conversely, the OC that remaining parts in the sedimentary framework is cycled gradually (around 10^{8} years. Sedimentary stores get to be interchangeable just through geologic elevate, trailed by oxidative weathering of OC by introduction to the climate. Net worldwide Primary Production (NPP) ashore (45–65 × 10^{15} g C $year^{-1}$) is overwhelmed by more labile non-woody plant tissues, for example, leaves, grasses, and herbaceous annuals. The most noteworthy gross physical OC generation (82 × 10^{15} g C $year^{-1}$) and capacity as biomass (56%) happen in the tropics, while polar areas contribute the slightest (8 × 10^{15} g C $year^{-1}$, 0.5%. Inside these districts, backwoods on one hand and leaves and tundra on the other, are the most and minimum beneficial individually, in this way reflecting worldwide examples of temperature and precipitation. Marine essential efficiency (around 50 × 10^{15} g C $year^{-1}$) is ruled by untamed water (pelagic) phytoplankton profitability since vast water constitutes roughly 75% of the aggregate sea range.

REFERENCES

1. Yadav R and Srivastava P. Visualization of High Throughput Genomic Data Using R and Bioconductor. J Data Mining Genomics Proteomics. 2016;7:197.

2. Tan Q, et al. Generalized Measure of Dependency for Analysis of Omics Data. J Data Mining Genomics Proteomics. 2015;6:183.

3. Shouval R, et al. Interpretable Boosted Decision Trees for Prediction of Mortality Following Allogeneic Hematopoietic Stem Cell Transplantation. J Data Mining Genomics Proteomics 2015;6:184.

4. Hjelmeland LM and Chrambach A. Solubilization of functional membrane proteins. Methods Enzymol 1984;104:305-318.

5. Aleme H, et al. Sereoprevalence of Immunoglobulin-G and of Immunoglobulin-M Anti-Toxoplasma gondii Antibodies in Human Immunodeficiency Virus Infection/Acquired Immunodeficiency Syndrome Patients at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. J Infect Dis Ther 2013; 1:119.

6. Nguyen VM, et al. How Long is Too Long in Contemporary Peer Review? Perspectives from Authors Publishing in Conservation Biology Journals. PLoS One 2015;10:e0132557.

7. Engels EA, et al. Trends in cancer risk among people with AIDS in the United States 1980–2002. AIDS 2006;20:1645–1654.

8. Simard EP, et al. Spectrum of cancer risk late after AIDS onset in the United States. Arch Intern Med 2010;170:1337–1345.

9. Shiels MS, et al. Age at cancer diagnosis among persons with AIDS in the United States. Ann Intern Med 2010;153:452–460.

10. Farooq W, et al. Efficient microalgae harvesting by organo-building blocks of nanoclays. Green Chem. 2013;15:749-755.

11. Lee YC, et al. Utilizing the algicidal activity of aminoclay as a practical treatment for toxic red tides. Sci Rep. 2013;3:1292.

12. Huang JM, et al. Studies on the integration of hepatitis B virus DNA sequence in human sperm chromosomes. Asian J Androl 2002;4:209-212.

13. Lenjisa JL, et al. Mortality of Adults on Antiretroviral Therapy with and without TB co-infection in Jimma University Hospital, Ethiopia: Retrospective Cohort Study. J AIDS Clin Res 2014;5:350.

14. Kalarani V, et al. Effect of Dietary Supplementation of Bacillus subtilis and Terribacillus saccharophillus on Innate Immune Responses of a Tropical Freshwater Fish, Labeo rohita. J Clin Cell Immunol. 2016;7:395.

15. Montesano C, et al. Impact of Human Leukocyte Antigen Polymorphisms in Human Immunodeficiency Virus Progression in a Paediatric Cohort Infected with a Mono-phyletic Human Immunodeficiency Virus-1 Strain. J AIDS Clin Res 2014;5:282.

16. Al-Farhan BS. Ultrasonic Preparation of Activated Carbon Composites for Removal of Cr3+ and Zn2+ Ions from Aqueous Solution. J Environ Anal Toxicol 2015;5:295.

17. Lockemann G. Aus dem Briefwechsel von Hermann Kolbe. Zeitschrift für angewandte Chemie 1928;41:623.

18. Klosterman LJ. A Research School of Chemistry in the Nineteenth Century: Jean Baptiste Dumas and His Research Students. Annals of Science. 1985;42:1-80.

19. Harold H. Quoting Armstrong without reference, in Studies in the History of Chemistry. Oxford: Clarendon Press, 1971;219-220.

20. Russell CA. Rude and Disgraceful Beginnings: A View of History of Chemistry from the Nineteenth Century. British Journal for the History of Science. 1988;21:273-294.
21. Aajjane A, et al. Availability of Three Phosphorus Fertilizers to Corn Grown in Limed Acid-Producing Mine Tailings. J Bioremed Biodeg. 2014;5:229.
22. Mittal P and Jain M. Proteomics: An Indispensable Tool for Novel Biomarker Identification in Melanoma. J Data Mining Genomics Proteomics. 2016;7:204.
23. Gutch RS, et al. Review Paper: Data Mining of Fungal Secondary Metabolites Using Genomics and Proteomics. J Data Mining Genomics Proteomics. 2015;6:178.
24. Dmitriev LF and Titov VN. DNA Replication and Telomere Shortening: Key Factors Related to the Production of C3-Aldehydes and the Interaction of One of them with DNA Guanine Residues. J Gerontol Geriat Res. 2014;3:175.
25. Runkel L, et al. Structural and functional differences between glycosylated and nonglycosylated forms of human interferon-ß (IFN-ß). Pharm Res. 1998;15:641–649.
26. Lee J, et al. Claspin, a Chk1-regulatory protein, monitors DNA replication on chromatin independently of RPA, ATR, and Rad17. Mol Cell 2003;11:329-340.
27. Chassaigne H and Lobinski R. Characterization of horse kidney metallothionein isoforms by electrospray MS and reversed-phase HPLC electrospray MS. Analyst 1998;123:2125-2130.
28. Patel SS, et al. Homology Modelling of Conserved rbcL Amino Acid Sequences in Leguminosae Family. J Data Mining Genomics Proteomics. 2014;5:154.
29. Benkelberg HJ and Warneck P. Photodecomposition of iron (III) hydroxo and sulfato complexes in aqueous solution: wavelength dependence of OH and SO4-quantum yields. The Journal of Physical Chemistry. 1995;99:5214-5221.
30. Li X, et al. Mechanism of photodecomposition of H2O2 on TiO2 surfaces under visible light irradiation. Langmuir 2001;17:4118-4122.
31. Kostyshin MT, et al. Photographic sensitivity effect in thin semiconducting films on metal substrates(Photosensitivity of semiconductor thin films deposited on metallic substrates in vacuum, noting photochemical transformation and photodecomposition of substance). Soviet Physics-Solid State 1966;8:451.
32. Gerischer H. Electrolytic decomposition and photodecomposition of compound semiconductors in contact with electrolytes. Journal of Vacuum Science and Technology. 1978;15:1422-1428.
33. Possanzini M, et al. Sources and photodecomposition of formaldehyde and acetaldehyde in Rome ambient air. Atmospheric Environment. 2002;36:3195-3201.
34. Ilisz I, et al. Investigation of the photodecomposition of phenol in near-UV-irradiated aqueous TiO 2 suspensions. I: Effect of charge-trapping species on the degradation kinetics. Applied Catalysis A: General. 1999;180:25-33.
35. Larson RA, et al. Ferric ion promoted photodecomposition of triazines. Journal of Agricultural and Food Chemistry. 1991:39:2057-2062.
36. Sayama K and Arakawa H. Significant effect of carbonate addition on stoichiometric photodecomposition of liquid water into hydrogen and oxygen from platinum–titanium (IV) oxide suspension. Journal of the Chemical Society, Chemical Communications. 1992:150-152.
37. Hammerschmidt CR and Fitzgerald WF. Photodecomposition of methylmercury in an arctic Alaskan lake. Environmental science & technology. 2006;40:1212-1216.

38. Ilisz I and Dombi A. Investigation of the photodecomposition of phenol in near-UV-irradiated aqueous TiO 2 suspensions. II. Effect of charge-trapping species on product distribution. Applied Catalysis A: General. 1999;180:35-45.
39. Berkes JS, et al. Photodecomposition of amorphous As2Se3 and As2S3. Journal of Applied Physics. 1971;42:4908-4916.
40. Gerischer H. On the stability of semiconductor electrodes against photodecomposition. Journal of Electroanalytical Chemistry and Interfacial Electrochemistry. 1977;82:133-43.
41. Hamd MAE, et al. Spectrophotometric Determination of Nifedipine and Nicardipine in their Pharmaceutical Preparations. Ind Chem Open Access 2015;1:103.
42. Okdeh M, et al. Determination of Carteolol in Pure and Pharmaceutical Formulation by Spectrophotometric Method. Med chem (Los Angeles) 2016;6:115-118.
43. Akl MA, et al. Surfactant Assisted Separation-Spectrophotometric Procedure for the Trace Analysis of Copper (II) in Drug and Water Samples Using a Heterocyclic Pyridyl Azo Dye. Pharm Anal Acta 2015;6:421.
44. Takeda N, et al. Effect of inert supports for titanium dioxide loading on enhancement of photodecomposition rate of gaseous propionaldehyde. The Journal of Physical Chemistry. 1995;99:9986-9991.
45. Srinivasan R. Kinetics of the ablative photodecomposition of organic polymers in the far ultraviolet (193 nm). Journal of Vacuum Science & Technology B. 1983;1:923-926.
46. Bachman J and Patterson HH. Photodecomposition of the carbamate pesticide carbofuran: kinetics and the influence of dissolved organic matter. Environmental science and technology 1999;33:874-881.
47. Kang MG, et al. Enhanced photodecomposition of 4-chlorophenol in aqueous solution by deposition of CdS on TiO 2. Journal of Photochemistry and Photobiology A: Chemistry 1999;125:119-125.
48. Kuo YL, et al. Analysis of silver particles incorporated on TiO2 coatings for the photodecomposition of o-cresol. Thin Solid Films. 2007;515:3461-3468.
49. Hassan HS, et al. Sorption Potential of Epoxy/Pac Composite for the Removal of Cs+ ion from Aqueous Solutions. J Environment Analytic Toxicol 2011;1:101.
50. Bohli T, et al. Adsorption on Activated Carbon from Olive Stones: Kinetics and Equilibrium of Phenol Removal from Aqueous Solution. J Chem Eng Process Technol 2013;4:165
51. Djelloul B, et al. Removal of Cationic Dye Methylene Blue from Aqueous Solution by Adsorption on Algerian Clay. Int J Waste Resources 2015;5:175.
52. Mulders KJM, et al. Phototropic pigment production with microalgae: Biological constraints and opportunities. J Phycol 2014;50:229-242.
53. Hirel PH, et al. Extent of N-terminal methionine excision from Escherichia coli proteins is governed by the side chain length of the penultimate amino acid. Proc Natl Acad Sci USA 1989;86:8247-8251.
54. Borden EC, et al. Interferons at age 50: past, current and future impact on biomedicine. Nat Rev Drug Discov. 2007;6:975-990.
55. Mehmood MA, et al. Use of Bioinformatics Tools in Different Spheres of Life Sciences. J Data Mining Genomics Proteomics. 2014;5:158.
56. Chini CC and Chen J. Human claspin is required for replication checkpoint control. J BiolChem. 2003;278:30057-30062.
57. Akl MA, et al. Comparative Adsorption Studies of Cd(II) on EDTA and Acid Treated Activated Carbons from Aqueous Solutions. J Anal Bioanal Tech 2015;6:288.

58. Vinuth M, et al. Rapid Removal of Hazardous Rose Bengal Dye Using Fe(III)–Montmorillonite as an Effective Adsorbent in Aqueous Solution. J Environ Anal Toxicol 2016;6:355.
59. El-Wakil AM, et al. Methylene Blue Dye Removal from Aqueous Solution Using Several Solid Stationary Phases Prepared from Papyrus Plant. J Anal Bioanal Tech 2015;S13:003.
60. Fasani E, et al. Structure and Medium-Dependent Photodecomposition of Fluoroquinolone Antibiotics. Photochemistry and photobiology. 1998;68:666-674.
61. Crosby DG. Experimental approaches to pesticide photodecomposition. In: Residues of Pesticides and Other Foreign Chemicals in Foods and Feeds/Rückstände von Pesticiden und anderen Fremdstoffen in Nahrungs-und Futtermitte. Springer, New York 1969;1-12.
62. Tabata M and Lund A. Structure and photodecomposition reactions of cations of cyclopentane, cyclohexane, cyclic olefines and dienes in γ-irradiated frozen solutions of CF3CCl3. An ESR study. Chemical Physics. 1983;75:379-88.
63. Crosby DG and Tang CS. Photodecomposition of 3-(p-chlorophenyl)-1, 1-dimethylurea (monuron). Journal of agricultural and food chemistry. 1969;17:1041-1044.
64. Tunesi S and Anderson M. Influence of chemisorption on the photodecomposition of salicylic acid and related compounds using suspended titania ceramic membranes. The Journal of Physical Chemistry. 1991;95:3399-405.
65. Domen K, et al. Photodecomposition of water and hydrogen evolution from aqueous methanol solution over novel niobate photocatalysts. Journal of the Chemical Society, Chemical Communications. 1986:356-357.
66. Tobias C, et al. Making the connection: the importance of engagement and retention in HIV medical care. AIDS Patient Care STDS 21 Suppl2007;1:S3–S8.
67. Pavlova-McCalla E, et al. Socioeconomic Status and Survival of People with Human Immunodeficiency Virus Infection before and after the Introduction of Highly Active Antiretroviral Therapy: A Systematic Literature Review. J AIDS Clinic Res 2012;3:163.
68. Soula F, et al. Physical Activity Participation and Cardiovascular Fitness in People Living with Human Immunodeficiency Virus: A One-Year Longitudinal Study. J AIDS Clinic Res 2013;S9:002.
69. Chauhan A. Sinorhizobium meliloti Bacteria Contributing to Rehabilitate the Toxic Environment. J Bioremed Biodeg. 2015;6:e164.
70. Okon E, et al. Evaluation and Characterisation of Composite Mesoporous Membrane for Lactic Acid and Ethanol Esterification. J Adv Chem Eng. 2016;6:147.
71. Engels EA, et al. Trends in cancer risk among people with AIDS in the United States 1980–2002. AIDS 2006;20:1645–1654.
72. Reyes H. Honesty and good faith: Two cornerstones in the ethics of biomedical Publications. Rev Méd Chile. 2007;135:415-418.
73. Sangarei, et al. Coinfection HIV and Malaria in Department of Paediatrics of the University Hospital Souro Sanou. J Hematol Thrombo Dis 2015;3:213.
74. Ahmed MM, et al. An improved experimental model for studying vertical transmission of hepatitis B virus via human spermatozoa. J Virol Methods 2008;151:116-120.
75. Warburg O. Über die Geschwindigkeit der photochemischen Kohlensäurezersetzung in lebenden Zellen. Biochem Z 1919;100:230–270.

76. Srinivasan R and Braren B. Ablative photodecomposition of polymer films by pulsed far-ultraviolet (193 nm) laser radiation: Dependence of etch depth on experimental conditions. Journal of Polymer Science: Polymer Chemistry Edition. 1984;22:2601-2609.
77. Crosby DG and Tutass HO. Photodecomposition of 2, 4-dichlorophenoxyacetic acid. Journal of Agricultural and Food Chemistry. 1966;14:596-599.
78. Feng Y, et al. Synthesis of mesoporous BiOBr 3D microspheres and their photodecomposition for toluene. Journal of hazardous materials. 2011;192:538-544.
79. Bainbridge Z, et al. A study of the role of tissue disruption in the removal of cyanogens during cassava root processing. Food Chem. 1998;62:291-297.
80. Matsuzaki K, et al. Analysis of Predictive Factors for Deterioration of Renal Function in Chronic Kidney Disease Patients. J Nephrol Ther. 2016;6:240.
81. Rajgovind SG, Deepak GK, Jasuja ND, Suresh JC. Pterocarpus marsupium Derived Phyto-Synthesis of Copper Oxide Nanoparticles and their Antimicrobial Activities. J Microb Biochem Technol. 2015;7:140-144.
82. Kodali S. Situational Awareness and Emergent Response Systems in the Context of Stages of Clinical Deterioration in the Hospital. J Nurs Care. 2014;3:171.
83. Anichi SE and Abu GO. Biodeterioration of Pipeline Concrete Coating Material by Iron Oxidizing and Sulphate Reducing Bacteria. J Phylogenetics Evol Biol. 2012;3:114.
84. Naveed S, et al. UV Spectrophotometric Method for Estimation of Ofloxacin in Tablet Dosage Form and Comparative Study of its Two Brands. J Bioequiv Availab 2016;8:125-127.
85. Elaziouti E, et al. ZnO-Assisted Photocatalytic Degradation of Congo Red and Benzopurpurine 4B in Aqueous Solution. J Chem Eng Process Technol 2011;2:106.
86. Baiza-Duran LM, et al. Safety and Efficacy of Topical 0.1% And 0.05% Cyclosporine A in an Aqueous Solution in Steroid-Dependent Vernal Keratoconjunctivitis in a Population of Mexican Children. J Clinic Experiment Ophthalmol 2010;1:115.
87. Chen Q, et al. Hydrogels for Removal of Heavy Metals from Aqueous Solution. J Environ Anal Toxicol 2012;S2:001.
88. Hanen N and Abdelmottaleb O. Modeling of the Dynamics Adsorption of Phenol from an Aqueous Solution on Activated Carbon Produced from Olive Stones. J Chem Eng Process Technol 2013;4:153
89. Oladele, Olakunle O. Microorganisms Associated with the Deterioration of Fresh Leafy Indian Spinach in Storage. J Plant Pathol Microbiol. 2011;2:110.
90. Ichihashi O, Hirooka K. Deterioration in the Cathode Performance during Operation of the Microbial Fuel Cells and the Restoration of the Performance by the Immersion Treatment. J Microb Biochem Technol. 2013;S6:006.
91. Meyer E, M'Gowan G. A History of Chemistry. Macmillan, London. 1891;298.
92. Bykov GV. The Origin of the Theory of Chemical Structure. Journal of Chemical Education. 1962;39:220-224.
93. Essers AJA, Bosveld M, Van der Grift R, Voragen AGJ. Studies on the quantification of specific cyanogens in cassava products and introduction of a new chromagen. J Sci Food Agric. 1993;63:287-296.
94. Basystiuk YI, Kostiv IY. Getting Hydrated Magnesium Chloride from Magnesium Chloride Solutions of Potassium Sulfate Fertilizers Production. J Chem Eng Process Technol. 2016;7:291.
95. Ofoegbu RU, Momoh YOL, Nwaogazie IL. Bioremediation of Crude Oil Contaminated Soil Using Organic and Inorganic Fertilizers. J Pet Environ Biotechnol. 2015;6:198.

96. Densilin DM, Srinivasan S, Manju P, Sudha S. Effect of Individual and Combined Application of Biofertilizers, Inorganic Fertilizer and Vermicompost on the Biochemical Constituents of Chilli (Ns-1701). J Biofertil Biopestici. 2011;2:106.

97. Augusto CAC, Silva LLA, Hannesch O. Total Microbial Populations in Air-Conditioned Spaces of a Scientific Museum: Precautions Related to Biodeterioration of Scientific Collections. J Bioprocess Biotechniq. 2011;1:106.

98. Ihde AJ. Development of Modern Chemistry Harper and Row, New York. 1964; pp: 4-8.

99. Du RY, et al. Effect of Bacterial Application on Metal Availability and Plant Growth in Farmland-Contaminated Soils. J Bioremed Biodeg. 2016;7:341.

100. Anacarso I, et al. Amoebicidal Effects of Three Bacteriocin like Substances from Lactic Acid Bacteria against Acanthamoeba polyphaga. J Bacteriol Parasitol. 2014;5:201.

101. Miranda JM, et al. Technological Characterization of Lactic Acid Bacteria Isolated from Beef Stored on Vacuum-Packaged and Advanced Vacuum Skin Packaged System. J Food Process Technol. 2014;5:338.

102. Anochie PI, et al. Tuberculosis and Human Immunodeficiency Virus Co-Infection in Rural Eastern Nigeria. J Med Diagn Meth 2013;2:118.

103. Bismara BA, et al. Antiretroviral Drug Resistance in Brazilian Children Infected by Human Immunodeficiency Virus Type 1. J Antivir Antiretrovir 2012;4:066-074.