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| **Environmental Enlightenment #157** By Ami Adini - Reissued April 8, 2016   |  | | --- | | This is a SHORT, LIGHT and SIMPLE newsletter. Its purpose is to rekindle in the initiated terminology they have once learned, and enlighten the uninitiated on terms they may have heard but never known the meaning of. | | **Potential of Hydrogen and the Cleanup of Contaminated Aquifers**   |  |  | | --- | --- | | Acid is a substance having a sour or sharp flavor. Most foods are somewhat acidic. Foods generally referred to as "acids" include citrus juice, vinegar, and wine. | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image002.jpg |  |  |  |  | | --- | --- | --- | | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image004.jpg |  | An alkaline substance is comprised of salts and other dissolved materials and is often found in desert soils and water. Most soaps are alkaline.  Alkalis are various soluble salts, principally of sodium, potassium, magnesium, and calcium; substances such as lye, soda or lime. Alkalis neutralize acids.  Acidity and alkalinity have ranges.  Substances  that are strongly acidic or alkaline can be corrosive. |   In chemistry we gradate acids and alkalis on a “pH” scale. The pH is a measure of the acidity or basicity (alkalinity) of a material when dissolved in water. It is expressed on a scale from 0 to 14. Roughly, pH can be divided into the following ranges:   |  |  | | --- | --- | | pH 0 - 2       Strongly acidic pH 3 - 5       Weakly acidic pH 6 - 8       Neutral pH 9 - 11      Weakly basic pH 12 - 14     Strongly basic  Materials with pH values of 0-2 or 11.5-14 may be classified corrosive.  The acidity or alkalinity of a solution depends on the number of hydrogen ions (H+) in the solution.  The term “pH” means “potential of Hydrogen.”  It is a measure of the activity of hydrogen ions (H+) in a solution. | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image006.jpg |   In-Situ Chemical Oxidation (ISCO) is a method of destruction of petroleum compounds in soil and groundwater through the process of *oxidation*.  ISCO is used to clean up petroleum contaminated soil and groundwater.   |  |  | | --- | --- | | *Oxidation*is the act of combining with oxygen. Oxidized metal is rusted. Iron oxide forms red-colored crust. | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image008.jpg |   In organic chemistry, oxidation typically results in the breaking up of complex compounds.  Substances that are built of bonds between hydrogen and carbon are called *hydrocarbons.*Petroleum products create one such family, the *petroleum hydrocarbons.*  Benzene is a *petroleum hydrocarbon.*It is a carcinogen.  When we clean up petroleum contaminated groundwater, benzene is a primary target compound.   |  |  | | --- | --- | | The benzene molecule is made of a ring of 6 carbon atoms (in black) clasping “hands” to create the central “ring,” and extending one hand each clasp a hydrogen atom (in white).  The chemical formula is C6H6 where “C” stands for carbon and “H” for hydrogen. | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image010.jpg |  |  | | --- | | Through oxidation, the benzene breaks up: | | Oxygen + Benzene **—>** Carbon Dioxide + Water |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image018.jpg | **+** | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image016.jpg | **=** | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image014.jpg | **+** | http://amiadini.com/NewsletterArchive/160408-NL157/envEnl-157_clip_image012.jpg |   In a similar fashion, oxygen breaks up all petroleum hydrocarbons to carbon dioxide and water.  Various methods are used in ISCO: one is the application of hydrogen peroxide. The hydrogen peroxide molecule has two oxygen atoms, and is quite unstable in that it strives to get rid of one and turn into plain water.  In certain applications of hydrogen peroxide in the ISCO process, it has been found that acidic environment is needed for the reactions to take place efficiently. A pH of 3 to 5 was found most productive. This is effected through the injection of sulfuric, citric, or other acids into the treated zone. | | You can find past issues of our "Environmental Enlightenment" at [amiadini.com](http://www.amiadini.com/)Wealth of information about environmental site assessments in the real estate transactions and issues concerning assessment and cleanup of contamination in the subsurface soil and groundwater. |  |  | | --- | | Call me if you have any questions. There are **no obligations.**  Ami Adini Environmental Services, Inc. Environmental Consultants & General Engineering Contractors California Lic. #1009513 A B HAZ ASB **818-824-8102**; [**mail@amiadini.com**](mailto:mail@amiadini.com) [www.amiadini.com](http://amiadini.com/)  Ami Adini is a veteran environmental practitioner with over 40 years of experience. He carries a Bachelor of Science degree (B.Sc.) in Mechanical Engineering including academic credits in Nuclear and Chemical Engineering and postgraduate education in these fields. His career includes design and construction of nuclear plant facilities, chemical processing plants and hazardous wastewater treatment systems. He is a former California Registered Environmental Assessor Levels I & II in the 1988-2012 registry that certified environmental professionals in the assessment and remediation of environmentally impacted land, and a Registered Environmental Professional (REP) since 1989 with the National Registry of Environmental Professionals (NREP). He is a California Business & Professions Code Qualifying Responsible Managing Officer (RMO) in the General Engineering Contractor classification with Hazardous Substance Removal and Asbestos certifications, and president of AMI ADINI ENVIRONMENTAL SERVICES, INC. (AAES), a general engineering contractor and consulting firm specializing in environmental site assessments, rehabilitation of contaminated sites and removal of environmental risks from real-estate transactions. (Contact Ami for a complete resume.) **AAES provides practical solutions to environmental concerns using the highest standards of ethics and integrity while providing its clients with maximum return on their investments.** | |