The production of everyday used materials such as oil and gas results in the buildup of radioactive materials in high concentrations. As a result of the commonality of this occurrence, a solution has been presented as to rid the world of this toxic waste. Purifying these radioactive materials with the use of various methods allows the pure substance to be reused and prevents the depletion of resources.

Introduction

Before we can understand how to purify these substances, it is important to understand the chemistry involved within to get a deeper understanding. Radioactivity was first discovered by Henri Becquerel in 1896 when he considered that the phosphorescent materials could be related to the glow emitted by X-rays. Rutherford further enhanced this discovery with his gold foil experiment to class the particles emitted by radioactive materials into classes based on their ability to penetrate through materials. Alpha particles are larger in size and therefore the least harmful because they cannot pass through something as thin as a sheet of paper. Through analyzing radioactive decay, it can be determined that alpha particles are positive. Beta particles are larger, carry a negative charge, and require a more dense substance to hinder their path. Gamma rays are neutral and by far the most dangerous of the three. These rays cannot be easily deflected and can even go through concrete. The term radioactive is defined as an unstable particle that releases subatomic particles. Examples include carbon-14, radium, uranium. Usually isotopes of elements have enough instability to fit this definition. Although these rays have a positive effect on some fields such as medicine in terms of x-rays, caution is used to prevent bodily damage. Scientists working with these substances wear protective gear as well as gadgets that records their exposure to the substance.

Methods of Purification

The most common method of purification of radioactive materials in very minute quantities is distillation. However, radioactive materials occur in large quantities and pose a bigger question. Rather than mass purify radioactive materials, they are currently placed deep underground until radioactive decay keeps it from being harmful.

Electro filtration method: Separation of liquid and solid phases to extract the pure substance with the use of electrodes

Filtration through a substance that reduces the radioactive material in question and then using a substance that will bind this reduced radioactive material will allow it to be separated from the remaining solution. This method has recently acquired a patent and is still undergoing experimental procedures but remains effective.

Purification of Radioactive Water

In nature water generally contains a plethora of impurities. These impurities can include small microbes to something as dangerous as radioactive substances. Methods such as boiling, Chlorination (use of household chlorine bleach), and purification tablets remove microorganisms. More rigorous modes of purification are used to rid the water of other wastes including radioactive materials. Groundwater is a common example in which radium, a radioactive element, is mixed with the water. This way produces a black sludge of radioactive water which is unhealthy for consumer usage. The radium can be removed through ion exchange or the conditioning of water. Other unnatural occurrences of radioactive materials require more meticulous methods. Distillation removed salts, heavy metals, and radioactive fallout (since water itself
cannot become radioactive, the radioactive components are referred to as radioactive fallout). Filtering the water will also remove the radioactive fallout.

References


Problems

1. What are way in which to purify water that contains radium?
2. What does the term radioactive mean?
3. Define the different kinds of emissions and their range of harmfulness.
4. What does distillation do that chlorination cannot achieve?
5. Why is it important to purify radioactive materials?