

Introduction

Potassium chlorate in its pure form is a white crystalline substance containing potassium, chlorine and oxygen atoms. It is the most common chlorate used as an oxidizing agent, disinfectant, source of oxygen, explosives, fireworks, and a component in pyrotechnics and chemistry demonstrations. Potassium chlorate can be made from household bleach and substitute salt.

Chlorate-based propellants are less susceptible to damage by water but can be completely unstable when there is the presence of sulfur or phosphorus. When a drop of sulfuric acid is added to potassium chlorate, a reaction is catalyzed; thus, producing heat and smoke as potassium chlorate decomposes to produce oxygen.

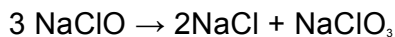


Sucrose is an easy-to-oxidize energy source and burns in the presence of oxygen. The flame is purple from the heating of potassium. For the experiment, granulated table sugar is preferable to powdered sugar because powdered sugar can smother the fire.

In the experiment, the sodium hypochlorite in the bleach is disproportionating to form sodium chloride and sodium chlorate. Potassium chloride is sold as a "sodium-free" salt substitute. Adding potassium chloride exchanges the ions and precipitates out potassium chlorate. Boiling is required for the reaction to work.

Outline of Methodology

Chlorine bleach (NaClO) is boiled until crystals start to form. Once crystals form, it is removed from the heat and allowed to cool. Boiling disproportionates the sodium hypochlorite into sodium chloride and sodium chlorate as shown in the equation below.



A saturated solution of potassium chloride is prepared in a separate container by stirring potassium chloride into water until no more will dissolve.

Equal amounts of the two solutions are mixed together, making sure none of the solids are included. Potassium chlorate will precipitate out, leaving just the sodium chloride in the solution. The reaction is shown below.



The solution is cooled in an ice bath to increase the yield of potassium chlorate. The sodium chloride is then filtered out using vacuum filtration, leaving just the potassium chlorate.

Equal parts of the potassium chlorate and sucrose are mixed in a container. Two drops of sulfuric acid are added and the resulting reaction is observed.

Sources

Helmenstine, Anne Marie, Ph.D. "Potassium Chlorate from Bleach and Salt Substitute" and "How To Perform the Instant Fire Chemistry Demonstration." *About.com*. Web. Accessed 20 August 2014.

<<http://chemistry.about.com/od/makechemicalsyourself/a/Potassium-Chlorate-From-Bleach-And-Salt-Substitute.htm>>

<<http://chemistry.about.com/od/demonstrationsexperiments/ht/instantfire.htm>>