Culminating Laboratory Assignment

Airbag Inflation

The goal of an airbag is to slow the passenger's forward motion as evenly as possible in a fraction of a second. There are three parts to an airbag that help to accomplish this feat:

* The **bag** itself is made of a thin, nylon fabric, which is folded into the steering wheel or dashboard or, more recently, the seat or door.
* The **sensor** is the device that tells the bag to inflate. Inflation happens when there is a collision force equal to running into a brick wall at 16 to 24 km per hour. A mechanical switch is flipped when there is a mass shift that closes an electrical contact, telling the sensors that a crash has occurred. The sensors receive information from an **accelerometer** built into a microchip.
* The airbag's **inflation system** reacts sodium azide (NaN3) with potassium nitrate (KNO3) to produce **nitrogen gas**. Hot blasts of the nitrogen inflate the airbag.



<http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/airbag1.htm>

***Your Task:*** Create a low-tech air bag by completely filling a Ziploc sandwich bag with CO2 gas. The reaction to be used for our air bag is **acetic acid and sodium hydrogen carbonate**.

**Day 1: Standardization of the Acetic Acid**

Titrate a known volume of acetic acid with a known concentration of sodium hydroxide. Complete at least 3 trials with consistent results and calculate the molar concentration of the acetic acid to be used for your air bag. Submit for evaluation on Day 2.[10]

**Day 2: Air Bag Reaction**

Using the calculated concentration from Day 1, complete stoichiometric calculations to determine the exact quantities of reactants required to completely fill (firm to the touch) the Ziploc bag. (remember, a gas is created in the reaction so room conditions are important) [5]

Measure out the appropriate amounts of reactants and perform the reaction. Show your completed reaction to your teacher for evaluation. [5]